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NEW YORK MUNICIPAL ART SOCIETY

Suggests Appointment of Commission to Plan the "City Beautiful"—Other Societies Lend a Helping Hand—Mayor Low Approves the Idea

THE civic problems in Greater New York are more numerous and difficult of solution than those of any other of the world's great cities. Even under the most favoring auspices, including a progressive, liberal, intelligent and energetic administrative government, it would require at least a period of twenty-five years to meet existing demands for all comforts and conveniences which should be found in a city like New York. In view of the inevitable changes in the municipal government, the problem becomes hopelessly complicated. No one can predict, with any degree of accuracy, when the improvements which are now urgently needed, to say nothing of the embellishment of the city, will be completed.

Nearly three hundred and fifty millions of dollars will be expended within the next ten years on improvements, now under way or projected, within the limits of Greater New York by the Federal, State and City Government. About two hundred and fifty millions will be devoted to the improvement of transit facilities, and nearly one hundred millions for public works, including streets and boulevards, libraries and other public buildings, reservoirs and water works improvements, bridges, etc. To wisely locate and adapt these various improvements to local conditions, and to carry out the general scheme for the development of Greater New York so as to provide for the demands of the future, require great knowledge and prophetic vision. Fortunately for the city it has the good will of numerous societies which are patriotic enough to give of their best toward the solution of this stupendous problem. The Municipal Art Society has been the leader in the movement to secure the appointment of a commission to deal with this great question. Referring to the work of this society, in his annual message, Mayor Low said:

MAYOR LOW APPROVES THE SUGGESTION

"Through the courtesy of the Municipal Art Society I have been furnished with a statement of what has already been suggested by various associations, along these lines. I think that a commission composed of men familiar with transportation and busi-

ness problems, as well as of men competent to guide and suggest from the point of view of art, may render a very great service to the City. I think that such a commission, at the outset, at least, should serve without pay, although a reasonable sum, say \$10,000, should be placed at its service for clerical and other expenses."

Through the personal efforts of Mr. Frederick S. Lamb of the Municipal Art Society, the needed changes and improvements which could be profitably considered by such a commission were given to the Mayor and summarized as follows: "This information is derived from the past work and the present suggestions of various public spirited societies and individuals whose courtesy it desires to acknowledge—and is contained in the amended report.

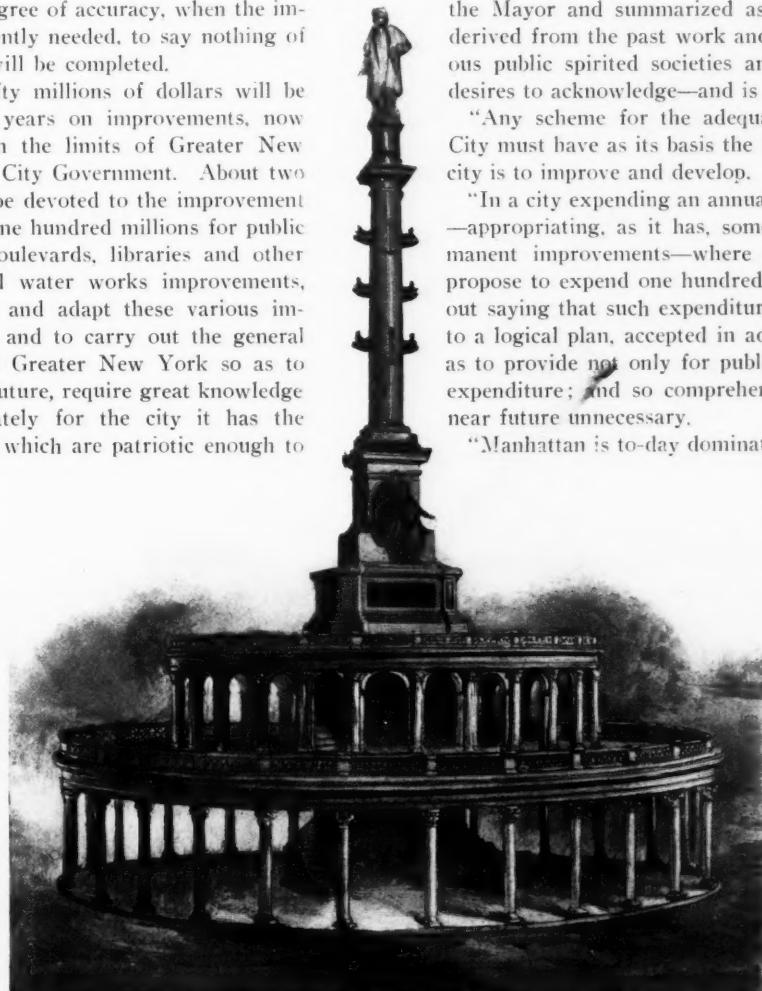
"Any scheme for the adequate beautification of the Greater City must have as its basis the fundamental plan upon which the city is to improve and develop.

"In a city expending an annual income of one hundred millions—appropriating, as it has, some two hundred millions for permanent improvements—where three private corporations now propose to expend one hundred and fifty millions—it goes without saying that such expenditure should be made with reference to a logical plan, accepted in advance, and so broad in its scope as to provide not only for public improvements, but for private expenditure; and so comprehensive as to make changes in the near future unnecessary.

"Manhattan is to-day dominated by a plan created in 1807, and as yet, unmodified in essential details; the other boroughs are still unrelated in structural plan; the suburbs, while tributary to the Greater City, are without its jurisdiction, and permitted, through deference to antiquated laws, to develop along lines which, as they prove inadequate, must be changed at enormous expense.

NEED OF COMPREHENSIVE PLAN FOR FUTURE DEVELOPMENT

"New York's location is such that it must become a greater center than the world has ever seen. Nothing but the folly of its cit-



A PROPOSED TREATMENT OF THE COLUMBUS MONUMENT, AT 59TH STREET

izens can postpone the prompt realization of this. A fundamental plan is necessary and needed now. The commercial supremacy of the city demands it. Private enterprise is paralyzed until it is had. Any practical scheme for embellishment must be based upon it, for it must wait the solution of our ever more pressing social problems in city growth. Public spirited citizens have no outlet for their civic interest, and generous donors no opportunity for their benevolence.

"The absence of such a plan makes co-operation with adjacent districts and neighboring cities an impossibility. Schemes proposed to-day must be changed to-morrow. Costly improvements adequate to local conditions must eventually be made obsolete by the steady growth of the Greater City.

"Millions upon millions are thus needlessly wasted. All projected

Society has had the valuable assistance and co-operation of the following important organizations, which it called in conference:

The Merchants' Association of New York.

The New York Board of Trade and Transportation.

The Manufacturers' Association of New York.

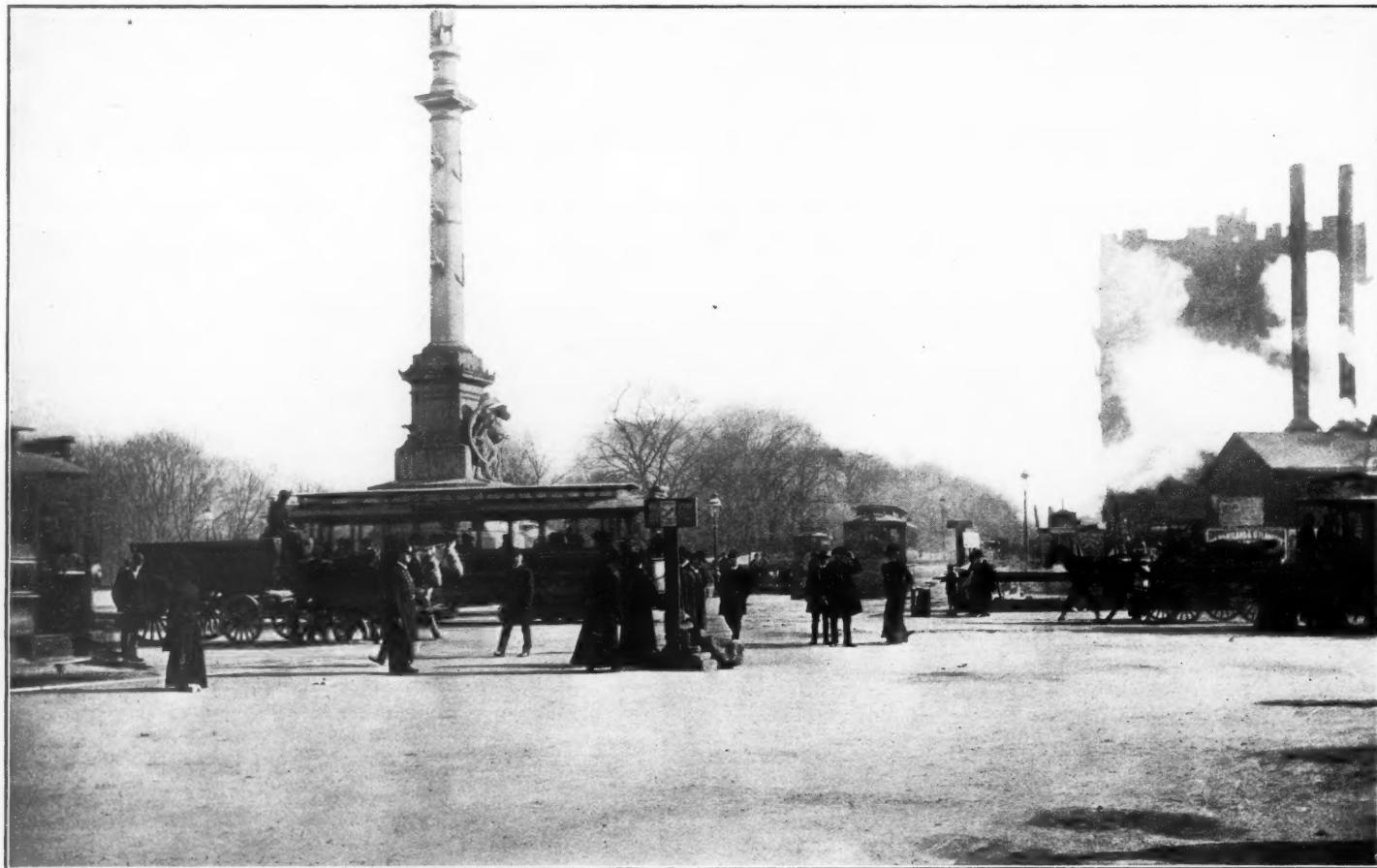
The American Society of Civil Engineers.

The Architectural League of New York.

The National Society of Mural Painters.

The National Sculpture Society.

"While it is not implied that the societies conferring have endorsed any of the suggestions other than those contributed by them, and those only as tentative examples to lead to better things, it is suggested that these schemes and plans, contributed during the last fifty years by leading engineers, artists and laymen, without hope of re-



SHOWING THE INCONVENIENCE CAUSED PASSENGERS IN CHANGING CARS BY THE PRESENT ARRANGEMENT OF CAR TRACKS, WHICH COULD BE AVOIDED BY PUTTING INTO EFFECT THE PLAN PROPOSED IN THE DIAGRAM ON THE OPPOSITE PAGE

developments are met with 'pleas of economy.' There could be no greater economy for the city than its adoption of an intelligent plan as to which details, as planned, shall conform. It need not be carried out at once, but its establishment would guide the imagination of our citizens and make possible the effective co-operation of all interested in the development of our world metropolis.

"Our conditions so differ from European ones as to make it difficult, if not impossible, to follow the precedents there set. The Haussmannizing of Paris, possible under imperial rule, might have been impracticable under the Republic. But while the precise methods adopted by the European cities may not be the best here, their failures can be utilized as timely warnings. The great imagination of the French people made possible the revivification of Paris on a scale, in its inception, considered adequate for the city for long years to come. But it has already been found too cramped in that it ignored outlying districts, and to-day definite action has been taken to raze the exterior walls and to permit the city to extend its area.

CO-OPERATION OF OTHER ORGANIZATIONS

"In the procurement of the information which it submits, the

enumeration, but simply with the desire of arousing public opinion and inciting interest, may form the basis of discussion from which some definite plan may be wrought out.

FREIGHT AND PASSENGER TRAFFIC

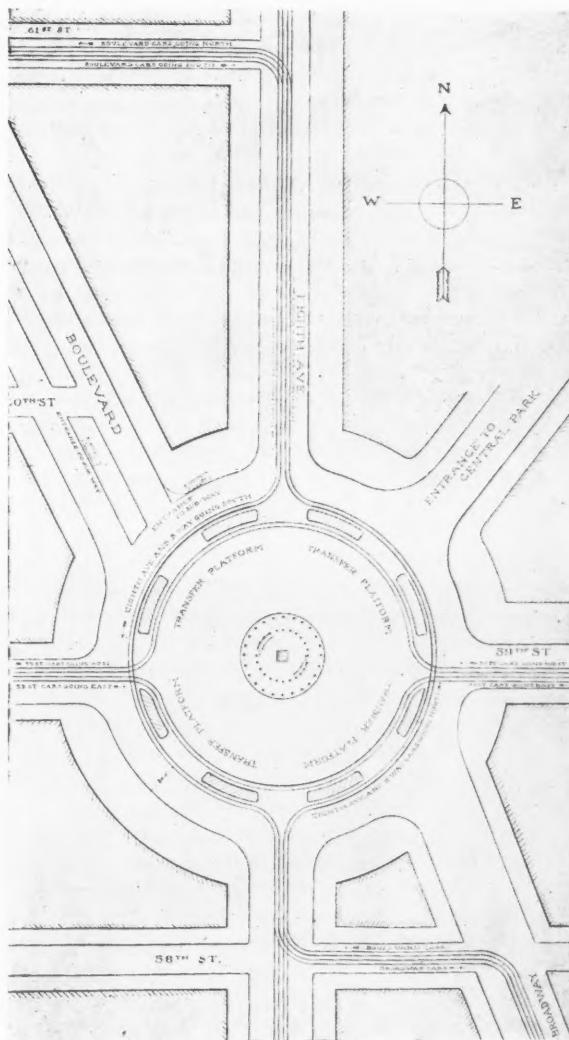
"Such a plan should transcend city limits and provide for great freight termini, such as the one proposed for Communipaw, with its logical changes of the contiguous property,—the Newark Meadows; readjustment of the New York Central tracks at Forty-second street; the Pennsylvania Railroad tunnel and the other tunnels to follow; possible canals for freight distribution; judicious development of the water fronts—and the eventual connection of these with the underground system. A successful city must be so planned as to permit economical and prompt delivery of merchandise. Natural advantages should be so supplemented as to utilize them to the utmost.

"The problem of passenger traffic should be met by realizing that in time every important street must have an underground—not as at present constructed, but with the street excavated from house line to house line, thus permitting at the sides ample room for electric conduits, pipe galleries and water mains, and saving in expense of re-

paving, excavation and water waste. Union stations could then be so placed as to easily distribute the immense and ever growing traffic. Avenues without adequate outlet should be extended to connect with main arteries. Bridge terminals should be made points of distribution and created to relieve congested districts. Slight modifications might materially benefit many existing points. Subsidiary streets and arcades should further relieve specially crowded hours; and street traffic on main avenues and along water fronts should be aided, through division, by isles of safety.

PARKS AND PUBLIC BUILDINGS

"The proposed plan, while considering existing park area, should add water front parks, connected by parkways and forming breathing



THE PROPOSED REARRANGEMENT OF TRACKS AT 59TH STREET AND
ESTABLISHMENT OF TRANSFER PLATFORMS

space, with appropriate opportunities for recreation. The small park system should be extended, not always by condemnation of large tracts or even blocks, but by competent designing of small tracts. Old parks could be easily rearranged to suit new conditions, and outlying districts so encouraged to acquire park reservations as to supplement the plan of the city itself.

"Any plan should consider the design, grouping or location of public buildings with reference not only to utilitarian requirements, but as factors of one or more convenient, attractive and dignified civic centers. Instead of letting government buildings be located at hazard, their location wait until sites are hard to get, reservations should now be made which, as the city grows, can be utilized as sites for monumental structures. Without the accident of the reservoir at Forty-second and Fifth avenue, a proper site for the public library would have been difficult to find. Many equally important projects are delayed, if not discouraged, by lack of proper location. The adoption of a proper plan would make possible the co-operation of

citizens interested in its welfare, and eventually by gift or bequest many public or quasi-public buildings would be added by private or semi-public enterprises. The location of libraries, hospitals, schools, colleges, settlement houses and charities could thus be so guided as to provide more appropriate city buildings.

DECORATION OF PUBLIC BUILDINGS

"Public buildings should have not only consistent architecture, but should have as well their sculptural and mural decorations selected with reference to the purpose for which the building was created and the historic interest of the section in which it is placed. Such buildings should be treated with rational decoration, considered at the inception of the building by men whose special artistic training fits them for such planning. The work should be regarded as an integral part of the building—the decoration to be appropriate in character and represent the art of our country. Public buildings would thus become storehouses of popular history, and the custodians of much now found only in isolated museums; and more that would never be created except for the opportunity thus furnished.

"A city is known by its monuments, and the truest test of citizenship is pride in records of those individuals who, from century to century, have contributed to its welfare; and of those events which, under test of time, have been deemed historic. Of all recommendations received, no list is longer than that of the subjects suggested for patriotic and historic expression—a water gate and triumphal arch at the Battery; a monument in Battery Park to record the growth of the country from immigration; a public forum at Union Square; a monument to the prison ship martyrs at Fort Greene, Brooklyn; a historic monument at or near Twenty-third street and Fifth Avenue, to record the events of the Civil War; historical tablets; memorial fountains—many if not all of which would be given by our public spirited citizens, if they could but feel that in so doing they were contributing to perfect the detail of a plan so grand that, when completed, it would make our city the leading city of the world.

"Such a plan as that proposed would be rather a guide for whatever the city might do than a requisition calling for action; nor would its realization involve drastic change of law. As was so ably stated by Mayor Hewitt in his message of 1888 to the Board of Aldermen:

"There are no such things as vested rights which can interfere with the power of the community to do those things which are essential for its growth, its safety and its progress in civilization.

"Improvident grants have been made; but, when they come in contact with the superior rights of the people, indemnity may be claimed and awarded, but their existence cannot be pleaded as a bar to improvement. This proposition is true not only of those companies which have their works under the streets, but of all companies which occupy them for any purpose whatever. The only theory upon which the rights of private corporations to use the public streets has ever been justified is that they give greater facilities to the purpose for which the streets were created. But the right of the city to require the streets to be used in such manner as will from time to time promote the general convenience of the community is unquestionable."

"With such authority in the hands of the city, with the unquestioned desire to co-operate on the part of great corporations, with the undoubted interest of our citizens, there is no reason why, if action is taken at the present time, the great results fore-shadowed in that address could not be achieved in the immediate future.

"With its noble harbor protected from injury, and the channels of approach straightened and deepened; with its wharves and docks made adequate for the easy transfer of the vast commerce of the country; with its streets properly paved and cleaned, and protected from destructive upheavals; with cheap, easy and rapid transit throughout its length and breadth; with salubrious and attractive parks in the centers of dense population; with an ample supply of pure water, now nearly provided; with a system of taxation so modified that the capital of the world may be free to come and go as the air of heaven, the imagination can place no bounds to the future growth of this city in business, wealth and the blessings of civilization. Its imperial destiny as the greatest city in the world is assured by natural causes, which cannot be thwarted except by the folly and neglect of its inhabitants."

THE MAINTENANCE OF ASPHALT STREETS*

**Arguments Against the Long-Term Guaranty—Value and Legality of Such a Guaranty
Seriously Questioned—Reasons Why the Short-Term Is Preferable**

By S. Whinery, M. Am. Soc. C. E.

THE question of the wisdom of requiring a long-time guaranty on public work, and particularly on street pavements, has not received the attention its importance warrants. Whether such guaranties, on the whole, are beneficial to the interests of a city, or otherwise, certainly admits of arguments on both sides. The arguments on the negative side, apparently, have not been worked out carefully, or pursued to ultimate consequences or conclusions.

LONG- OR SHORT-TERM GUARANTIES

The speaker does not include in this discussion those short-period guarantees to the effect that any defective materials, or workmanship, appearing within a period of six months, or one year, shall be made good by the contractor, nor to those which require that machinery, or plant shall accomplish certain stipulated results. There can be no question about the propriety and the advantage of such guaranties. Nor is it intended to discuss that class of guaranties which requires that work constructed with comparatively unknown materials, or performed by unusual methods, shall fulfill the requirements stipulated. Without attempting, at this time, to enter upon a full discussion of the wisdom of requiring long-period guarantees upon street pavements, reference may be made to some of the more important arguments against the practice.

The general theory upon which such guaranties are based is that the responsibility for the good and sufficient quality of the materials used, and of the workmanship and skill, is thrown upon the contractor under conditions which he cannot afford to disregard. In short, the object is to shift responsibility for the character of the work from the city authorities to the contractor. No one can object to this as a principle. The city is undoubtedly justified in taking any reasonable measures that will compel the contractor to comply fairly and fully with the requirements of his contract. The only question, therefore, that may be raised, is, whether, on the whole, such guaranties, in their practical workings, result, or can be made to result, to the advantage of the city. This embraces the question whether such guaranties, as they are usually framed, can be legally enforced, under the conditions that usually prevail in street-paving contracts.

VALUE OF LONG-TERM GUARANTY QUESTIONED

In the first place, assuming that such guaranties are entirely legal, their value must depend upon the ability of the city to enforce them. Sufficient surety must be required from the contractor, and the question at once arises: "What amount of surety is sufficient?" It is a well-known fact, well-known, at least, to contractors, that the cost of maintaining a pavement under conditions to which it may be subjected for ten or even five years may vary from 5 to 100 per cent. of its original cost. The cases are quite frequent where the cost of maintenance will equal 50 per cent. of the original cost, even when the work has been faithfully and skilfully done. In those cases where the work has been done by an unskillful, or dishonest, contractor, it is not safe to figure that less than one-half of the original cost may have to be expended to make good the guaranty for a period of even five years, particularly if the streets paved are subjected to heavy travel. Consequently, it may be stated as a general proposition that the surety required from contractors, in the case of asphalt pavements, will not insure the city against loss unless it is equal in amount to one-half the cost of construction. It will at once be replied to this statement that enormous areas of asphalt pavement have been constructed

in American cities under guaranties running from five to thirty years, where the amount of surety required has varied only 10 to 30 per cent. of the contract price, and that defaults by the contractor have been rare and unimportant. But it must be remembered that the asphalt pavements of this country have been constructed under a peculiar set of conditions. The work has been done largely by a few large companies whose business interest in the promotion and extension of asphalt pavements was such that they could not afford to default on these guaranties, even if their business responsibility and honor had not impelled them to comply with obligations incurred.

WHAT SHOULD BE THE AMOUNT OF THE GUARANTY

There have been a great many cases in every large city having a considerable area of asphalt pavements where the surety in possession of the city has been less than one-third of the amount expended by the contractor to maintain the guaranty. There are many contracts involving a fifteen-year guaranty in existence in the city of New York, where the tangible surety in possession of the city does not equal one-half the amount it will cost the contractor to comply with the guaranty. It will depend entirely upon the honor and integrity of the original contractors, or their successors, whether or not these contracts are lived up to until the end of the guaranty period. Sufficient examples have occurred to show what may be expected in cases where an irresponsible or dishonest contractor has been awarded work. The history of the asphalt pavement on Eighth Avenue, New York City, is a good illustration. How long the conditions prevailing in the past will continue, no one can say, but it may be safely predicted that, if the time ever comes when competition is as open in the asphalt paving business as in other work, and when cities shall award contracts to the lowest bidder regardless of other considerations, it will be found necessary to require an amount of surety equal to at least half the original contract price.

TWO WAYS OF PROVIDING SURETY

There are two usual methods of providing surety for the integrity of such guaranties. In the one, a part of the money that would otherwise be due the contractor upon the completion of his work, is withheld from him until the expiration of the guaranty period. Now, if it be true that surety to the amount of one-half the contract price must be provided in order to make the city safe, the contractor would receive, under this plan, only 50 per cent. of the value of the work at his contract price. Knowing this, he must do one of two things. He may bid prices that will be sufficient, when 50 per cent. is retained, to pay the actual outlay for the work, or he may, if he possesses the capital or can command it, bid prices that will enable him to carry the retained balance during the period of the guaranty, as well as to pay the expenses of sustaining the guaranty. In the first case the work will be open to contractors of moderate or large means, alike, but the city must pay double the actual cost of the work. In the second case the contractor of moderate means will be shut out entirely, and a very few, of the wealthiest only, will be able to compete, and even then these wealthy contractors must bid prices that will compensate them for carrying the unpaid balance over a long period. In either case the city must pay the cost of the surety it requires. And, since contractors will usually bid prices that they think are on the safe side, particularly where conditions are such that exact cost cannot be determined, the city must usually pay a very high price for its security.

In lieu of retaining a part of the contract price, many cities require the contractor to give a bond with sureties deemed sufficient to make the bond good. These sureties may be either private persons or surety companies. Personal surety is notoriously unreliable. Even if the persons signing a bond are perfectly responsible at the time, they may be paupers before the end of five years. Whatever may be the cause, or causes, it is a notorious fact that not in one case out of

* This discussion (of the paper by James N. Hazlehurst, M. Am. Soc. C. E., printed in *Proceedings* for May, 1902), started in the February issue, opened by Mr. Hazlehurst, City Engineer of Mobile. It is continued in this number by Mr. S. Whinery, of New York City, N. Y., first appearing in the *Proceedings* of the American Society of Civil Engineers, Vol. XXVIII, No. 8, October, 1902, commencing on page 730. Mr. N. P. Lewis, Consulting Engineer to the Board of Estimate and Apportionment of New York, will continue the discussion. (Copyright, 1902, by the American Society of Civil Engineers.)

twenty, in our American cities, where the bond is forfeited is recovery actually made from personal sureties. It results that most cities now require contractor's bonds to be under-written by surety companies in good standing. But these surety companies are naturally averse to signing the bonds, of even the most responsible contractors, where they extend over a considerable period of years, and if they consent to do so they charge high rates for the service, and usually require collateral security from the contractor. The contractor must meet the expenses thus incurred, and must bid prices that will cover them, and the city must in the end pay liberally for the surety it exacts.

SURETY COMPANY BONDS NOT ALWAYS RELIABLE

Without any intention of impugning the honor or the integrity of surety companies, it must be remembered that, corporations being without souls, they may possibly avail themselves of legal technicalities to escape the payment of large sums of money for which they are bound. Therefore, it is exceedingly important that no possible grounds of invalidity exist in contracts thus secured. In very few instances, the speaker believes, have surety companies been called upon to make good for defaulting paving contractors; but it is not impossible that, if called upon to pay large sums on account of such default, it would be discovered that even this class of surety is not always to be relied upon implicitly.

It has been claimed that contractors, in framing their bids, do not add much, if anything, to their prices to cover the expenses of a guaranty, but such a claim is too absurd to be considered seriously. The contractor, usually, is not a blockhead, and he is not in the business simply for benevolence or amusement. It is true, he cannot estimate exactly what it will cost him to maintain the guaranty, and if he is new to the business he may very greatly under-estimate that cost, but, whatever he thinks it may be, he adds it to the price he would otherwise bid, unless, indeed, he counts upon repudiating, or escaping, the guaranty entirely.

It may be that sharp competition, and a desire to control the business, will cause him to bid prices which he knows will not cover the cost of the work, but if he has had any experience in the business, he knows that the cost of the guaranty is as palpable a quantity as is that of the pavement itself.

It must be evident, therefore, that the city must pay very liberally for the benefit the guaranty is supposed to confer.

LEGALITY OF QUESTION DEMANDS MORE ATTENTION

In the second place, the question of the legality of long-time guaranties demands more consideration than it has received. Where pavements are paid for by special assessments upon the property benefited by the improvement, the courts have held, almost universally, that while the original cost of the improvement may be assessed against benefited property, the subsequent cost of maintaining the work cannot be thus assessed. In those decisions which uphold the validity of time guaranties, this principle is not denied, but an attempt is made to evade it. They set up the plea that the terms of the guaranty do not necessarily require the maintenance, in the proper sense of the word, of the pavement, but only that the contractors shall do the work with such materials and such skill that maintenance will not be necessary during the guaranty period; and if it shall become necessary to repair the pavement within that period, the fact is simply evidence that the contractor did not do the work in the manner required, and, therefore, must make good the consequences of his failure. This reasoning, in the speaker's opinion, is specious and erroneous. It may be sound, as an abstract legal theory, but, when confronted by the facts as they are known to every practical man, its sophistry cannot but be apparent. It may be safely asserted that no street pavement, subjected to even moderately heavy travel, will endure for five years, much less for a longer period, without the necessity for more or less repair, which no fair-minded person competent to judge can attribute to defective construction. The use of the familiar phrase, "ordinary wear and tear excepted," in very many guaranty clauses tacitly admits the fact. It is obvious that the repairs necessary to a pavement after it is two or three years old may be divided into two classes: First, those that may be due to the use of materials or labor not up to the requirements of the specifications; and, second, those made necessary by the wear and tear of use, whatever may have been the character of the original construction. Under

the general principle of law referred to above, the contractor, in the first case, may be clearly held to his guaranty without danger of legal complications. Under the second, the property owner may justly object to being assessed specially for what is clearly maintenance of the work.

VARIED COURT DECISIONS

The decision of the Alabama Court, cited by the author, it seems to the speaker, is a striking example of fine-spun legal theory misapplied to practical facts and conditions. The learned judge concludes his decision with a fine-sounding dictum which was doubtless intended as a clinching argument in the legal knock-down of the whole fabric of the theory opposed to that held by the court. Speaking of the requirements of the guaranty clauses in question, he says: "It is an incident of the contract, not an independent undertaking."

When, it may be asked by the practical man devoid of legal acumen, does such a guaranty clause cease to become an incident of the contract and not an independent undertaking? It is an incident until the end of five years, why not until the end of ten years? And why may it not continue to be an incident during the whole life of the pavement?

If it is answered that it continues to be an incident only as long as may be necessary to establish the fact that the work was done with such material and skill as the contract called for, other questions arise. Just what length of time is required to disclose defective workmanship and materials? Is that period of time, assuming that it can be determined, a fixed and well differentiated period, or may it be affected by conditions which must vary with different streets, and even with different parts of the same street? Is the "incident" period the same on such a street as Broadway, New York City, and on the residence streets of the smaller cities, or even of those of New York City? Is it true that five years' use of a pavement on a heavily traveled street in any large city will develop nothing more than inherent defects in the original construction? And, that the effect of wear and tear of travel, which is not an incident of the contract, will begin the day after the expiration of the five years and not before? And, if it does not begin on the last day of the five years, when will it begin? If the guaranty of the pavement and the expense of maintenance it entails is merely an incident of the contract in the sense the Court seems to hold, would the contractor add anything to his price because of the incident? It is found, as a matter of fact, that the expense of maintenance entailed by the guaranty is invariably added by the contractor to his estimate of first cost, or is always considered in fixing the price in his original bid, does the Court still hold that it is merely an incident of the contract?

Notwithstanding the great importance of the question of the validity of these long guaranties, decisions of the higher Courts covering it have been comparatively few, but a large majority of these have been to the effect that they are not legal when they relate to work paid for by special assessment. Cases involving the legality of these guaranties apparently have not been brought before the Courts in a large majority of the States, and in these it remains an open question. The far-reaching effects and the serious financial results which would attend adverse decisions in many of the older States, where hundreds of thousands of square yards of asphalt pavement are covered by such guaranties, make the question one of very serious importance.

The absence of litigation and resulting decisions in so many of the States may be largely due to the fact that the large companies by whom the greater part of the asphalt pavement in this country has been constructed have, for reasons of their own, consented to, if they have not actually encouraged the requirement of, long-time guaranties.

AN IMPORTANT FEATURE OVERLOOKED

There is one important feature of these long-time guaranties that seems not to have been brought before, or considered by, the Courts at all; that is, that in nearly every city the terms of contracts for paving, including the guaranty requirements, are general, and are made to apply to all streets alike. No allowance is made with respect to different streets for different conditions of use. Thus *A* and *B*, two parallel and contiguous streets, are paved at the same time, under the same form of contract, and possibly by the same contractor. *A* is a main business street with very heavy travel, while *B* is a residential

street, with very little travel. The work on both may be done with the same materials and with the same degree of care and skill, so that the pavements when completed are practically identical. The contractor, in framing his bids, having the facts in mind, would almost certainly bid a higher price per square yard on *A* than on *B*, because the maintenance of the pavement for the guaranty period will cost very much more on *A* than on *B*. Let it be assumed that the period of guaranty on *B* be such that its pavement would just endure to the end of the period without any repairs due to maintenance proper. During the same period, the pavement on *A*, subjected to very heavy travel, will have required a large expenditure for repairs due to the wear and tear of use. To pay for the pavements, the property owner on *A*, obviously, must be assessed for a much larger sum per unit than the property owner on *B*. If the property owner on *A* should resist the assessment on the ground that a part of his assessment was for maintaining the pavement and not for construction, and should appeal to the Courts, it is difficult to understand upon what grounds his plea could be refused, or the validity of the guaranty sustained. This particular ground of invalidity could be avoided by such a change in the nature of the guaranty as would require that the pavement should endure a stipulated, definite quantity of use, without showing indications of failure, as for instance, the passage over it of a certain number of tons of travel, the quantity to be ascertained by censuses of travel taken at intervals of time in accordance with specified rules and regulations. The speaker has long believed that this is quite practicable, and that it constitutes the only rational and just basis for guaranties that are intended to test the endurance of a pavement.

THE PROVISIONS OF THE GUARANTIES CONSIDERED

At this point may be considered some provisions of these guaranties which have their foundation in the attempt to keep their requirements within legal bounds.

If the contractor is required to maintain the integrity of a pavement for a period of years, care must be taken that nothing is done by the city, or by other persons with the permission of the city, that will release the contractor from his obligation. For instance, the city may not remove and then repair a part of the guaranteed pavement, nor may it authorize persons other than the contractor to do so, since not only may the contractor claim that the adjoining pavement was injured in the operation, but he may claim that defects appearing later are within the area of the pavement disturbed and repaired by parties other than himself, and for which he cannot, therefore, be held responsible. It is generally difficult, if not impossible, even with the aid of carefully prepared diagrams, to locate accurately, after the lapse of a year or two, the exact boundaries of such repaired areas. Therefore, it has been found desirable, if not essential, to couple with the guaranty a provision that the guarantor shall make all necessary cuts into and replacements of the pavement, at a stipulated price. Usually, not much consideration has been given to the reasonableness of this price, as it has been assumed that it was an unimportant item. Very commonly, the price has been fixed at a certain per centum above the contract price for the construction of the pavement. If, therefore, the guaranty period was long and the contract price accordingly high, the price for such repairs was quite likely to be exorbitant. The result is illustrated nowhere better than in New York City, where, owing to extensive improvements in transportation systems and other underground structures, enormous areas of pavement have to be removed and replaced at prices so high as to make the cost of the work a very serious burden to those who must pay for it. It is probably true that this repair work is to-day, in New York City, the principal source of profit to the contractors who laid the pavement, or to their successors. Even if the price for repairs, thus stipulated, were reasonable at the time the contracts were made, the great decline in the cost of asphalt pavement since that date makes them now abnormally high, and suggests the conclusion that it is unwise to continue a practice which seems necessarily to involve the making of contracts extending over long periods of time for supplies or services, the market value of which is likely to be subject to great fluctuations.

ENTAIL ADDITIONAL EXPENSE TO CITY

Before dismissing this branch of the subject, it is worth noting that, where maintenance is embraced in contracts for construction, the cost of maintenance being embraced in the price bid, the contractor practically receives payment for the maintenance in advance, and, in the

cases of long-period guaranties, so many years in advance that the resulting loss to the city is very great. In some of the contracts for the pavement of Broadway, New York City, it is very evident that the contractor, in fixing the price bid by him, regarded the maintenance as likely to cost nearly twice as much as the construction. Yet the city paid him the whole sum upon the completion of the work of construction. It is true that a large percentage of the sum was retained by the city, but this was held as surety, additional to the bond given, for the performance of his obligations (and it may be said, in passing, that as security it was very inadequate), and was not withheld with the view of paying for a part of the service when that service should be rendered. When it is considered that the largest part of the cost of maintenance will almost certainly be expended in the last half of the guaranty period, it will be appreciated that the advance payment must be a matter of large gain to the contractor and of large loss to the city.

There is another point which is of sufficient importance to merit consideration in this connection. If the city requires the contractor to guarantee certain results, he may justly claim that he must be left free as to the means by which these results are to be obtained and that if the city assumes to dictate, as by prescribing definite specifications and the means to be used, he, the contractor, cannot be held responsible for results. It would seem, therefore, a very dangerous procedure, from a legal point of view, for a city to attempt to compel a contractor to guarantee work, constructed not in accordance with his judgment and experience, but in strict compliance with specifications formulated by the city's agents.

PRINCIPLES TOO WELL KNOWN TO REQUIRE LONG GUARANTY

In the early history of the asphalt pavement, when its merits were questioned and distrusted, when the properties of the material used were not well understood and the methods of constructing it were not familiar to engineers, it cannot be doubted that the requirement of some guaranty of results was not only justified, but was required by ordinary business prudence. But that time is now past. The essential quality of the material is known and can be determined in the laboratory or by experiment, and the principles of its construction are well understood. The fact that engineers do not now hesitate to prescribe how the work shall be done, down to its minutest details, is sufficient evidence that they feel competent to deal with the subject as freely as with any other engineering problem.

It is scarcely creditable to the profession that in the present state of the art and science of pavement construction we must depend upon contractors' guaranties to secure good work.

The necessity for a guaranty of endurance, therefore, seems no longer to exist. In view of these conditions, and others which time does not permit the speaker to detail now, he is, and has been for many years, of the opinion that it is both unnecessary and unwise to continue longer these long-time, or, as they may more properly be called, endurance, guaranties. He does not believe that, upon the whole, they result to the advantage of the cities, or are worth what they cost. There seems to him to be ample evidence that, whether judged from the economical or the legal standpoint, it is unwise as well as dangerous to complicate construction contracts with provisions for maintenance in such a way that they are not readily separable. A guaranty extending over a short period, sufficient to disclose defects of construction that might have been overlooked as the work progressed, would be entirely unobjectionable. It should not extend over two years. With such a guaranty our cities can safely rely upon their engineers to prepare adequate specifications, and to enforce them so as to secure work of the highest standard of excellence. In cases where the local engineering talent may happen to be without the requisite knowledge and experience, there are not a few specialists whose services could be readily secured, in the capacity of consulting engineer, as is the practice in other branches of engineering work.

If it is thought advisable, maintenance of the pavement, after the expiration of the short guaranty, can be made by contract either with the contractor who constructs the pavement or with others.

Some of the advantages claimed for the long-period guaranty could be secured by embracing in the original contract for construction provisions for the maintenance of the pavement, after the expiration of the short guaranty, at a stipulated price per square yard per

year, payable yearly when the service shall have been rendered. In case the work is to be wholly or partly paid for by special assessments, only the cost of construction could then be assessed upon property owners, and the cost of maintenance could be paid from the general funds of the city.

MR. HAZLEHURST WORKING IN RIGHT DIRECTION

The speaker agrees with Mr. Lewis that the plan adopted by Mr. Hazlehurst is in the right direction, if long-period guaranties are to be continued, as it attempts to separate the guaranty from maintenance. But the plan adopted involves, to some extent, the common fallacy that the cost of guaranteeing the work on one street is practically the same as on any other street. Thus, the author bases his price for maintenance on the average cost of maintenance in Washington and other cities, ignoring the fact that the conditions in Mobile may be such as to make such average cost totally inapplicable to the streets of that city. If his plan were adopted in New York City under general specifications, used, as is customary, for the whole season's work, the absurdity of applying the Washington average, or of assuming that the specified maintenance price would apply alike to Broadway and to a short residential street in the Borough of the

Bronx, would be palpable. If the author had carried his plan a little further and had asked bidders to name prices for maintenance during the second and third periods of five years, as well as a price for construction, he would then have approached a rational method; but even then he would have compelled the contractor to guess at the conditions that would probably prevail on a certain street fifteen years in the future. The speaker uses the word "guess" purposely, because in our comparatively young and rapidly developing American cities, no one can foretell what changes in the growth and distribution of travel on any street may take place within a period of even ten years.

Mr. Lewis evidently has the impression, which is thought to be quite general, that the contractor, in making up his bid, adds little or nothing, to his price for construction, to cover the guaranty.

In making up hundreds of bids every year, the speaker, for himself and for the company with which he was for a long time connected, always added to the computed construction price on each street the estimated cost of maintaining the guaranty. The price thus arrived at, however, was not always the price his company bid, because various circumstances and the exigencies of competition often dictated the price, regardless, within certain limits, of the estimated cost.

(To be concluded in April)

MEDINA BLOCK STONE PAVEMENTS

Good Points of Medina Stone Pavement Enumerated by an Expert—Used for Fifty Years in Rochester—Model Methods of Construction

By E. A. Fisher, Mem. Am. Soc. C. E.*



EDWIN A. FISHER, C. E.

AMONG the requisites for a first-class stone pavement carrying a heavy traffic may be mentioned the following:

1. It must be economical, not only as regards its first cost but also as to its maintenance.
2. It must be durable.
3. It must not wear so smooth as to become slippery and unsafe for horses, and at the same time must afford the minimum of traction.
4. The general surface should be constructed and maintained in such condition that water will not remain on any part of the pavement.

5. The joints should be close, and the general surface smooth, to reduce the noise to a minimum.

The foundation is of the first importance in any pavement, and should receive the same care and attention as any other engineering work. This care should begin with the formation of the sub-grade.

PRELIMINARY PREPARATIONS

Preliminary to the preparation of the sub-grade all underground construction required, such as additional sewers, water pipes, gas pipes or electric conduits, should be put in, or the existing structures replaced with larger, if required. All lateral connections required for abutting lots and intersecting streets for sewers, water, gas and electricity should also be put in. The existing gas and water pipes left in place should be carefully examined, especially if they have

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—[EDITOR.]

been laid for a long time, for evidence of leaky joints, and such repairs as found necessary, made. The services, both water and gas, in streets occupied by an electric railway using the rails for a return, should be carefully examined for evidence of corrosion from electrolysis, especially if the pipe system is, or has been in the past, positive to the rails. In wide streets, especially if occupied by a railway, it is a very good plan to have a water pipe and a gas main, also an electric conduit, on each side of the street. This plan avoids disturbing the pavement for enlargements of connections or for additional connections, and eliminates the danger to services from corrosion due to electrolysis in a decently constructed street railway system.

If the work is let by contract the entire work should be done by one contractor. All trenching and backfilling should be done by this contractor, or under his supervision. The experience of the writer is, that practically no trouble has occurred from settlements in streets constructed by the asphalt companies who are required to guarantee the pavement for ten years, except where they sub-let the foundation work. Some of the worst settlements that he has observed occurred in sewer trenches backfilled at least ten years previously to the time the pavement was laid.

In the backfilling there should be at least four tampers to each shoveler. The material should be put in in thin layers and the rammers should weigh at least one pound for each square inch of face.

In the case where sewer or water pipes have been laid in the street, previous to the construction of the pavement, the backfilling of these trenches should be carefully and thoroughly examined by the contractor, and if found loose and unsuitable for supporting the new pavement, the loose material should be removed and replaced in a satisfactory manner.

After completing the backfilling of the trenches and the examination and refilling of all old trenches that require attention, the whole surface of the roadway should be thoroughly consolidated by rolling with a steam roller weighing not less than ten tons, and portions inaccessible to the roller should be tamped with square faced hand tampers weighing not less than one pound per square inch of face. All depressions, or settlements, should be made up with good material and the surface of the sub-grade, when completed, should be exactly parallel to the surface of the finished pavement, except where it is desired to vary the thickness of the concrete foundation.

CONCRETE FOUNDATION

Upon the foundation prepared as specified, a concrete foundation, generally six inches in thickness, should be laid. In the case of streets of little traffic, and where a comparatively small amount of excavation has been made in the sub-grade, natural cement concrete may be safely used. The proportions of this mixture should be one of cement to two of sand and from four to five of broken stone.

In the case of streets having heavy traffic and where a large amount of excavation has been done for underground structures, Portland cement concrete foundation should be put in. This concrete should be composed of one part of Portland Cement, three of sand and from six to seven of broken stone.

The importance of a strong foundation for a pavement has not generally been recognized. A few years ago, in a correspondence with one of the largest manufacturers of natural cement in this vicinity, the manager said that his concern manufactured different varieties of Portland cement, and gave the names of the different brands, some of which he asserted were equal to any other American Portland cement. He also stated that they manufactured a cheaper grade which was good enough for street pavement foundations; thus showing that he considered the foundation of a street pavement as of secondary importance, when compared with other engineering structures.

If is the opinion of the writer that as much care should be used in the construction of the concrete foundation of a street pavement as in any other concrete work. The maximum load which the pavement has to bear comes upon it as soon as the street is opened. The cement therefore should be a reasonably quick setting cement.

Great care should be taken to make the top surface of the concrete foundation exactly parallel with the surface of the finished pavement. This is one of the most important things to be observed in the construction of the pavement, as it is desirable that the thickness of the sand cushion should be made as nearly as possible uniform over the entire pavement.

CURB STONES

Curb stones should be of hard and durable stone. The best quality of stone for this purpose in the vicinity of Rochester is the Medina sandstone, and the specifications prepared by the writer require this stone. The stone should be not less than three feet in length, (preferably from five to eight feet) six inches thick and eighteen inches in depth. The inside top corner of the stone should be rounded to a radius of about one and one-fourth inches. This curved portion and the top should be axed to a smooth surface. The face of the curb should be dressed to a true surface with no projections or depressions of more than one-fourth inch for a depth of at least ten inches down from the top. The back should be point dressed for three inches down and hammer dressed on the remainder of the surface. The bottom should be roughed off parallel to the top and the full width, and should be not less than six inches shorter than the

top. The ends for at least twelve inches down should be squared and dressed so that when laid the end joints should not exceed one-fourth-inch. This curb should be set on a concrete foundation six inches thick and thirteen inches in width. The portion in front of the curb should be connected to the foundation of the pavement. The concrete should also be carried up on the back of the curb six inches in thickness and to within six inches of the top of the curb. This concrete should be of the same composition as that for the foundation of the pavement.

A three-inch farm tile should be laid in coarse gravel under the concrete foundation of the curb, and the joints covered with gunny cloth. The bottom of these drains should be at least two feet six inches below the top of the curb and connected with the surface sewers. Curbs set in this way are not affected by frost and remain indefinitely in place. It is the general practice in this city to set these curbs before fully completing the sub-grade.

FOUNDATION FOR STREET RAILWAY TRACKS

The rails of the street railway tracks should be full grooved girder rails eight to nine inches in depth, weighing about 100 pounds per yard.

The rail used largely in recent work in New York City, also in Rochester and other cities, known as the "Trilby" rail, is a very good section. These rails should be laid upon a solid Portland cement concrete foundation twelve inches in depth under the rail, put in with the pavement foundation. The rails should be electrically welded. In case no settlement in the sub-grade is probable, old iron rails four and one-half inches in depth, placed six feet center to center, may be used as ties to hold the rails in place. The concrete should be carefully tamped under the rails and then grout poured



MEDINA STONE PAVEMENT ON STATE STREET, ROCHESTER, N. Y.

along each side of the rail. Otherwise wooden ties laid two feet from center to center may be used. The concrete in this case should be carried entirely across the space occupied by the tracks and five inches below the ties. The concrete should be carefully rammed under the rail. Both methods have been in successful use in this city for five years.

SAND CUSHION SHOULD BE OF UNIFORM THICKNESS

The concrete foundation having been prepared as aforesaid, the curb set, all permanent fixtures in the street, such as railway tracks, manhole heads for sewers and conduits, surface sewer inlets, etc., should be adjusted to the proper grade and crown of the finished street after which the sand cushion for the paving block should be spread upon the foundation. The sand should be moderately fine, clean, sharp and dry. The normal thickness should be about two inches.

Much of the success of the pavement depends in keeping this sand cushion of as nearly a uniform thickness and compression as possible. In the case of a brick pavement the experience of the writer is that it should be uniformly one inch in thickness. In the case of block stone, however, more latitude must be allowed. Our specifi-

cations require stone of a depth of from six to six and one-half inches. With this depth of stone the surface of the concrete should be left eight inches below the finished grade. The maximum cushion, therefore is two inches, and the minimum one and one-half. Our experience is that this is a proper allowance. In the case, however, of block stone laid outside the street railway tracks and connecting with an asphalt pavement, the stone block should be bedded in Portland cement mortar, instead of being laid on a sand cushion. A number of streets in the city of Rochester have been constructed in this way and have proved much more serviceable than when laid upon a sand cushion.

DIMENSIONS AND QUALITY OF STONE

The stone blocks should measure not less than three nor more than six inches in thickness, and not less than six nor more than six and one-half inches in depth, and from seven to twelve inches in length. About four and one-half inches in thickness makes the most satisfactory pavement.

The stone should be of uniform quality and texture, free from quarry checks or cracks, and be quarried from fine grain live rock, showing a straight and even fracture. These stones should be prepared in the usual manner for dressed block paving by nicking and breaking the stone from larger blocks, and not by redressing or selecting from common stone paving material.

The blocks should have parallel sides and ends. The top and bottom surfaces should be parallel and the area of the bottom nearly equal to the top surface. The stone should be so dressed that the joints in the pavement will not exceed one-half inch. There should be no large lumps upon the surface of the blocks. A slight roughness will soon wear to a smooth surface.

MANNER OF LAYING THE BLOCKS

The stone blocks should be laid in straight courses at right angles with the line of the street, except in intersections of streets, when the courses should be laid in such a manner that the traffic from the intersecting streets will not run parallel with the courses. Each course of blocks should be of uniform width and depth, and laid so that the end joints shall be close and be broken by a lap of at least three inches. The joints between courses should be not over one-half inch in width, top and bottom.

As the blocks are laid they should be covered immediately with clean, hot, dry gravel, artificially dried, which should be brushed into the joints at a depth of at least three inches. The block should then be thoroughly rammed by courses at least three times, by a hammer weighing not less than eighty pounds; no iron of any kind being allowed on its face to come in contact with the paving, and until brought to an unyielding bearing with a uniform surface true to the roadway on the established grade. The surface of the pavement should be constantly tested by a long straight edge.

THE USE OF PAVING PITCH AS A FILLER

After ramming, in case paving pitch is used as a filler, the joints

should then be filled with clean, dry, hot gravel, poured from cans having small spouts, and thoroughly settled in place with wire picks. The top of this gravel should be two inches below the top of the pavement. The gravel used should be of such a size as will pass through a sieve having four meshes per square inch, and be retained upon a sieve having sixty-four meshes per square inch, and must be screened when dry. This screening should be done on the work. The paving pitch should be immediately poured into the joints while the gravel is still hot. The pitch should be of the best quality for the purpose, and heated to a temperature of 300 degrees F., and should thoroughly fill all of the joints and interstices of the gravel filling. It will be necessary to re-pour the joints from two to three times before the filling will remain flush with the surface. The dry, hot gravel should then be poured along the joints filled with paving pitch, as described. Great care should be taken in the selection of this paving pitch. The best guarantee of a good filler is to select a brand that has proved satisfactory, and continue its use.

Paving pitch should be used as a filler in streets having large traffic which cannot be closed for a sufficient time to allow a cement grout to properly harden, and also where it is probable that the pavement will need to be taken up more or less in the future.

WHEN THE PAVEMENT IS GROUTED

In case of streets where the opening to traffic is not of so much importance, and where a reasonable permanency of the pavement may be expected, the pavement may be grouted. The grout should be mixed in the proportion of one portion of Portland cement to one portion of clean, sharp sand, in small quantities at a time. The grout should be of the consistency of cream, and should be constantly stirred while in the box and rapidly applied to the



MEDINA STONE PAVEMENT ON EXCHANGE STREET, ROCHESTER, N. Y.

pavement. No settling or residue should be used. The stones should be wet before the grout is applied, and the pouring should be done until the joints remain full. All traffic should be rigidly excluded from the pavement for at least ten days of good dry weather after the grout has been applied. In case that this work is done late in the season, traffic should be kept off the street at least two weeks.

A grouted pavement will undoubtedly wear much longer, and remain in better condition than one where paving pitch is used as a filler. We have in this city two pavements laid on streets of moderately heavy traffic, one of them having a double track street railway, paved with first-class common Medina stone on a rolled gravel foundation, with joints grouted with a mixture of Portland cement and sand, as heretofore described. These pavements have been in use from seven to eight years, and except at the joints of rails of the street railway tracks, are in as good condition as when laid. It should be said, however, that no excavation has been made in either of these streets since the pavement was put down. Other pavements constructed in this manner have been badly damaged by excavations for underground structures. A first-class pavement laid

on a concrete foundation can, with proper care, be taken up and replaced without serious injury.

SOME OF THE OTHER DETAILS

The crown of a 30-foot roadway is generally five inches; a 40-foot, six inches; a 50-foot, seven inches; the usual rule being to make the rise at the center in inches one-sixth of the width between curbs in feet.

The minimum grade of gutters should be four inches per 100 feet. The curbs at corners of intersecting streets should be set to as large a radius as the width of the walk will permit, and in case of right-angle streets, from twelve to twenty feet.

Crosswalks should generally be laid in from three to five lines, with one course of paving between the stones. The width of each course should be 18 inches, and the thickness for heavy traffic, six to seven inches. The end joints of the stones should be cut on a bevel of four inches, so as to come as near as possible at right angles to the line of traffic from intersecting streets. Surface sewer inlets should be put in on the upper side of all intersecting streets so that the crosswalks at said intersecting streets may be slightly raised.

QUALITY OF STONE

The Medina stone, from which the paving blocks in use in the city are obtained, comes from quarries along the line of the Erie Canal between Rochester and Lockport, N. Y. The nearest quarries are at Huberton, about thirty miles west of Rochester. The stone varies somewhat in color and texture in the different quarries. It is generally of a red or pink color. The crushing strength of this stone from the town of Medina is given by Gen. Gilmore at 17,500 pounds per square inch on bed, and 14,812 pounds per square inch on edge. Specimens from Albion gave 13,500 pounds per square inch on bed, and 11,350 pounds per square inch on edge. The crushing strength of other varieties of stone by the same author is given for comparison:—

	Lbs. per Sq. In.
Middletown, Conn., brown stone.....	6,000
Haverstraw, N. Y.	4,300
Cleveland, Ohio	7,250 to 10,250
Other prominent sandstones	4,250 to 8,000
Limestones, Erie County, N. Y.	12,250
Other limestones	6,650 to 25,000
Granites, Keene, N. H.	10,375 to 12,875
Other granites	13,000 to 22,000

It will thus be seen that this stone compares favorably even with granites, in crushing strength. The weight, per cubic foot, is about 150 pounds. The stone is fine grained, but does not polish and become slippery with use.

MEDINA STONE USED IN ROCHESTER OVER FIFTY YEARS

Medina stone pavements have been laid in Rochester for over fifty years. The earlier pavements were made of common Medina stone, and on account of the numerous excavations that have been made in the streets are of course at the present time in bad condition.

Medina block stone pavements have been laid since 1893. The main business portion of Main street was laid in 1894, at a cost of \$3.32 per square yard. The cost at present is about \$2.75 per square yard. The pavement on Main street, after nearly eight years' use, is in very good condition. Slight repairs have been made on the pavement for the last three years. It is a mistaken idea to suppose that any kind of pavement will last indefinitely without repair, and an

economical way to maintain a pavement is to make any needed repairs as soon as required.

The daily traffic, based on observations made August 23, 1900, on a portion of Main street, is as follows: 1,250 loaded vehicles, 1,200 empty vehicles and 1,274 carriages. The estimated weight in tons is 7,500. The width between curbs is sixty feet. There is a double track railway in the street over which cars pass at the rate of three per minute.

We have a total of a little over nine miles of Medina block stone pavement in this city, and, including the amount paid for by the Railway Company, about 262,000 square yards. We have in addition about twenty-one miles of common Medina stone pavements, or 350,000 square yards. No common Medina stone pavements have been laid since 1896, block stone being exclusively used.

TWENTY-TWO YEAR OLD MEDINA STONE PAVEMENT IN CLEVELAND

Medina stone pavements were laid first in Cleveland, Ohio. The writer was recently shown a Medina block stone pavement on one of its main streets about twenty-two years old. This pavement was built on the natural ground of the street and the joints filled with pitch. The pavement was in good condition. The blocks were worn smooth on the top, and not rounded, as is generally the case with granite.

So far as the writer is aware, there are no statistics available as to the life of Medina block stone pavements on a concrete base, or as to the cost of maintenance. Any statistics relating to the cost of maintaining common Medina stone on sand are misleading, and generally of no value. Many of the pavements have not been maintained in a condition fit for travel. In the business streets the pavements have been ruined by numerous excavations for pipes and conduits of various sorts, and are left in an almost unbearable condition for years.

The following extract from a report of a Committee on Street Pavements for the city of Detroit, made in 1890, gives their opinion of Medina stone as a paving material. They found Medina stone of two grades. Amount laid in Buffalo, 133 miles; Cleveland, 45 miles, and Columbus, 7 miles. The specifications for Buffalo require blocks of nearly equal size, seven inches high, not less than four inches wide and six to eight inches long. The joints are filled with asphalt cement. For second-class Medina stone a foundation of eight or ten inches of sand is used. A foundation of eight to ten inches is used in Cleveland where the subsoil is of a sandy nature, and twelve to eighteen inches in Buffalo where part of the soil is sand and part is of clay. This stone is of irregular sizes and in cases the joints are filled with sand.

First-class Medina stone is a very durable and comparatively smooth pavement, and not being so hard as granite, is not so slippery. It has been found to wear evenly, and is especially adapted to heavy traffic.

The Committee recommended, among other things, that "no pavements in future be laid in Detroit without a six inch concrete foundation and a four inch drain tile under the curb; that first-class Medina sandstone with filled joints be used on all heavy traffic streets."

The use of this stone for first-class pavements is rapidly increasing. The city of Brooklyn has recently laid two streets with Medina blockstone.

The opinion of the writer, based upon observation and experience, is that a stone pavement laid with first-class Medina block stone, in the manner herein described, more nearly fulfills the conditions of an ideal pavement for heavy traffic than any other stone of which he has knowledge.



THE BITULITHIC PAVEMENT

How It Perpetuates the Good Qualities of Macadam and Eliminates Its Objectionable Features—Large Amount Laid Last Year

By *Walter B. Warren, Assoc. Am. Soc. M. E.**



WALTER B. WARREN, M. E.

ROAD users, property owners, and public officials are united in the opinion that for beauty, for pleasure driving and for heavy teaming, there is no pavement which excels a newly constructed macadam road. The good footing it furnishes for horses, combined with the absence of noise under traffic, has made it most popular, and brought it into more extensive use than any other form of construction. Where stone is abundant, as in the New England and Middle States, almost every municipality is fitted out with the necessary plant for thus improving its parks and thoroughfares.

These municipalities recognize its advantages to such an extent, that hundreds of miles are built annually, notwithstanding its faults made manifest by the heavy expense of maintenance.

THE DEFECTS OF MACADAM PAVEMENT

What are these faults or defects? What is their cause, and how can they be overcome? They are, first, Washing out. The particles of stone in a macadam are not held together sufficiently to prevent heavy rains from loosening them, washing out the fine particles from the surface and leaving the large stone exposed to traffic to sooner or later become loose, causing them to be picked or kicked out. As an illustration of the extent of this defect we have a report from a city in Massachusetts having upwards of one hundred miles of macadam, showing that one heavy rain last summer did damage to the roads estimated at between thirty and forty thousand dollars.

Second. Dust, mud and frost. The finer particles of stone on the surface of the pavement are partly bound together by being wedged in place under heavy rolling and partly by the binding effect of fine particles of stone partially filling the voids in the coarser particles. The stones are not selected in definite proportions of each size with a view to making the surface of greatest density and it would be of no avail if they were. It is impossible to make an absolutely dense mixture from broken stone alone, and owing to the adhesion between the surfaces of the stone, rain penetrates into and under the surface, thus making the pavement not only subject to action of frost, —which loosens the whole construction,—but so saturates it, that under travel the stones move on themselves and displace some of the finer stones from the surface. This displaced material is the cause of much annoyance, as it takes the form of dust in dry weather, some of which is caught up by every wind, or passing vehicle, while in wet it forms a slippery mud to be-spatter the pedestrian and the horseman alike, as well as the user of the automobile. So dusty does the macadam road become in dry weather that living on the abutting

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property would be unbearable were its effect not counteracted by continued water sprinkling, itself objectionable by the mud it creates. It is frequently the case where the street departments' appropriations are so limited that expenditures for sprinkling are not warranted, that property owners themselves unite in engaging, by private contract, the necessary labor and apparatus, in order that they may not be annoyed by blowing dust.

The taking up of water by the surface of the pavement has another effect due to alternate freezing and thawing. The warmth of the



THE BITULITHIC PAVEMENT PAVEMENT LAID ON A THIRTEEN PER CENT. GRADE, PARK HILL, YONKERS, N. Y.

sun's rays in the middle of the day thaws the surface, thus producing water which, when evening approaches, freezes and makes an icy coating over the macadam, a condition only temporarily removed by the midday thaw of the day following. This icy coating makes travel very difficult on hills in the early morning and evening.

HEAVY EXPENSE FOR MAINTENANCE

These defects are well exemplified in New York City on Seventh avenue between Central Park and the Viaduct, where the mud is ever present from early fall to late spring.

The expenditures which are necessary on the part of this municipality in keeping their macadam roads in good condition prove to be great.

It is estimated that Seventh avenue, between the limits before mentioned, cost the city of New York between thirty and forty cents

per yard per year to keep in repair. The question arises sooner or later in the minds of the public officials: Can the city afford to lay a pavement, the cost of maintenance of which is so great?

There has been no pavement on the market up to within the past two years that has demonstrated itself to be suitable for the uses to which this thoroughfare is put. Asphalt is considered too slippery for road drivers who frequent the thoroughfare. Brick is not only too slippery but too noisy, while, of course, stone blocks are out of



PARK PLACE, PAWTUCKET, R. I.—PHOTOGRAPH TAKEN FEB. 7, 1903, SHOWING PAVEMENT AFTER TWO YEARS' USE

the question on every resident street. It was absolutely necessary for the authorities to continue the rebuilding of the macadam for want of something that would meet the requirements.

A similar problem recently came before the "city fathers" of Fall River, the largest cotton manufacturing center in the United States, and next to the largest city in Massachusetts. The city is built on a side hill at the foot of whose slopes are the wharves and docks where the large cargoes of cotton, iron and coal are unloaded. All of these materials have to be hauled in heavy drays up the long 9 per cent. slope to the many mills distributed throughout the city. So steep is the hill that there is only one thoroughfare on which heavy loads can be drawn, so that the entire business of the wharves is confined to one road. By actual count it was found that 3,500 tons of cotton alone passed over this hill daily. Macadam has been the only form of construction which could be used on this grade, stone blocks having been tried and found too slippery for hauling the heavy loads and brick or asphalt is objectionable for the same reason. The expense of maintaining this street was estimated by the street department at between forty-five and fifty cents per yard a year. That it has continued to be relaid almost every year for fifteen years is not because the authorities are unmindful of the heavy maintenance expense, or injudicious in the managing of their affairs, but because there was no alternative for them, but to maintain a road which would be at all times passable, thus aiding the rapidly increasing business of this hustling community. As in the New York case cited, it was not a question of whether the city could afford to lay macadam, but rather, what else could it do?

THE NEW PAVEMENT SOLVES PROBLEM, IT IS CLAIMED

Within the past two years a pavement has come before the public under the name of "The Bitulithic Pavement," otherwise known as "Warren's Bituminous Macadam Waterproof Pavement," which has become recognized as the solution of many paving problems, as it was to these two important thoroughfares. It changes the macadam from the class of a temporary roadway to that of a permanent pavement, retaining all the good qualities of the former and perpetuates them until finally the stone itself, of which it is built, is, in years of travel, worn away by the abrasion of the wheels.

This modern improvement has been investigated and endorsed by engineers not only in every state in the Union but by eminent men

from other countries. It is built in sound scientific principles and is the logical development of years of experience in road building as well as in the manufacture and uses of the materials which go to make up its construction.

The foundation consists of a layer of well rolled crushed stone similar to the foundation of an ordinary macadam but differing therefrom, in that it is cemented together from the top with a waterproof bituminous cement making it a rigid mass, able to stand great pressure. This bituminous concrete has had the test of over thirty years as a foundation under hundreds of miles of street pavements and is superior to hydraulic cement concrete for this purpose, as it facilitates drainage underneath the pavement, resists expansion and contraction better and offers a rough surface over which the two inches of wearing material can be spread and by compression forced into it so that the wearing surface and the foundation are one solid inseparable mass; at the same time it is sufficiently elastic to assist the surface to stand the pounding and abrasion roadways are subject to.

The material in the wearing surface is very carefully selected to best stand continued traffic.

METHODS OF CONSTRUCTION

Over 90 per cent. of this layer is a stone whose good wearing qualities are assured by careful laboratory and mechanical tests. Various sizes of stone are heated and mixed together with suitable machinery to the end that the combination will be as nearly the weight of solid stone as is possible. This is accomplished by taking predetermined proportions of stone from one and one-half inch diameter to one five-hundredths of an inch and while hot, thoroughly coating and mixing each particle with an elastic bituminous cement in sufficient quantities to more than fill the voids in the mineral aggregate. This cementing mineral serves to bind the particles of stone together, when laid in position on the street and compressed with heavy macadam rollers. It is carefully refined and tested with the most modern machinery and apparatus especially designed for this purpose; with a view to making it withstand all the conditions to which it may be subjected. It is manufactured sufficiently elastic to reduce to a minimum the effect of the stone working on themselves under traffic and at the same time offer a little spring to horses' hoofs, which not only makes it easier on the horses but tends to reduce the noise. It is made absolutely waterproof so that this surface of the roadway will be non-absorbent, thus giving it sanitary advantages over macadams, as well as over many other forms of improved roads. The cement being absolutely unaffected by water and, therefore, waterproof, there can be no deterioration from this cause, as is the case with a bituminous cement made from asphalt, as generally used in asphalt construction, *i. e.*, a combination of



MAIN STREET, EVERETT, MASS.—PAVEMENT LAID IN 1902, PHOTOGRAPHED FEB. 7, 1903

asphalt and sand. The rotting of asphalt is well exemplified in the gutters and depressions of asphalt pavements and frequently over the entire area where the pavement is subject to continued sprinkling.

ITS DURABILITY

As the stone has great load sustaining qualities in itself it is possi-

ble to use a very flexible bituminous cement thereby giving the latter much greater life than is possible with other bituminous pavements as well as lowering the temperature at which it becomes brittle. In asphalt, for example, the sand, of which about 90 per cent. of the total wearing surface consists, is not able to stand a load by itself, and it is therefore necessary to use a hard bituminous cement to support the sand and make it possible for the combination to withstand traffic. By making the bitumen thus hard, its life is shortened to a large degree. The selecting of a dense mineral aggregate which, after the admixture of the cementing material, leaves no voids unfilled, protects the latter from evaporation so that no perceptible change takes place in many years in its physical or chemical properties. In addition to these advantages the bituminous cement used in this construction is more ductile, of greater tenacity and has greater strength as a cementing material, than any other bituminous cement. Similar material has been subjected continuously to the elements and in actual use for twenty-five or thirty years. The manufacturers of this pavement, who, with their father, have been connected with the manufacture and use of coal tar products for over half a century, being the pioneers in this industry. The use of cement so holds the stone together that, no dust or mud are possible, sprinkling is not required and the stone is put to the actual test of wear. The combination of this cement with a hard durable stone as above described, was invented by Frederick J. Warren, and was the logical outgrowth of an intimate knowledge of the paving business and its requirements. The idea was unquestionably a new one, and its novelty recognized by the several patents issued by the United States Government as well as Canada, England, Belgium, Italy, Russia, Germany and France. "Like most practical inventions in matters of construction, the theory is very simple and its practicability appeals to the trained engineer as well as to the intelligent layman. Notwithstanding the simplicity of the theory it requires a vast amount of work on the part of practical and scientific men familiar with bituminous pavement construction to practically and correctly carry out the theories of the construction.

THE APPARATUS USED TO LAY PAVEMENT

"The development of the idea has also required the invention of new apparatus for the manufacture of the bituminous cement and for combining it with the mineral aggregate and for separating the sizes of stone so they may be brought together in the definite proportions necessary to give the maximum density desired.

"Entirely new apparatus has also been devised for making the essential aboratory tests of the bituminous cement; the mineral aggregate and the combination of them used in the pavement."

It is the policy of Warren Brothers Company to encourage reputable contractors having the necessary equipment and capital to become interested in this construction and it sells the necessary bituminous cement right to construct the pavement under its patent, and the necessary laboratory work and expert advice on reasonable terms to such contractors.

The first pavement laid under these patents was in Pawtucket, R. I., on a 12 per cent. grade. One of the accompanying illustrations was made from a photograph taken after two years' use, together with the letter received from Mr. George A. Carpenter, City Engineer, will show that the pavement has had and stood well the test of time, and is an ideal piece of work. Over forty different cities representing a majority of the states of the Union and Canada, after investigating carefully the methods as well as the finished work under traffic, last year adopted the bitulithic pavement to the extent of over 750,000 square yards, equal to forty-five miles of thirty-foot roadway and it is being considered on more than two million square yards at this time. An accompanying illustration of one of last year's pavements, together with a letter from the Superintendent of Streets of Brookline, Mass., Mr. Michael Driscoll, who is also President of the Massachusetts Highway Association, is an example of the satisfaction these more recent pavements are giving. Warren Brothers Company, the constructors of this roadway have been in receipt of over two hundred letters from prominent engineers endorsing the pavement, each speaking in the highest terms of their investigations or their experience with its use. Of all letters received there was not one engineer who was not convinced of its superior characteristics and so expressed himself.

WIDELY ENDORSED

It is a solution of many paving problems as it proved to be for Seventh avenue, New York, and for Pocasset street, Fall River, the difficulties of each of which were discussed earlier in this article.

The following organizations in New York investigated and recommended to the highway department its extensive use in New York City:

Seventh Avenue Protective & Improvement Assn.; New York Road Drivers Assn.; Highway Alliance; Associated Cycling Clubs; Harlem Board of Commerce; St. Nicholas Avenue Improvement Assn.; Automobile & Track Owners Assn.

The Associated Road Users of America, which consists of the following organizations, also endorsed it:

Automobile Club of America; New York Truck Owners Assn.; Road Drivers' Assn. of New York; Associated Cycling Club of New York; National Assn. of Automobile Man'frs; Associated Cycling Club of Long Island City; League of American Wheelmen; Staten Island Driving Club.

It has also been endorsed by the Commissioners of Public Works



HARVEY STREET, PAWTUCKET, R. I.—TWELVE PER CENT. GRADE—TWO YEARS' USE—PHOTOGRAPHED FEB. 7, 1903

and the Chief Engineers of New York as containing many advantages over other forms of pavement. In the Fall River example above cited, the engineer and superintendent of streets recommended its adoption for their heavy travelled streets in question, and the Council voted to expend the money necessary so to do.

Many conditions came to the public attention similar to these two and it is about as the eminent engineer, Mr. W. E. McClinton, Chairman of Massachusetts Highway Commission, said at a recent meeting of the Highway Association, after a careful inspection of the pavement in actual use on hills:

"I know of no pavement that we have to-day that will meet the requirements as it has been met by Bituminous Macadam. It is what every road builder for years has been trying to have, namely, a good, smooth, even pavement which even on a steep hill will shed the water, is free from dust, which will wear, and which will not be slippery."

Mr. Chas. W. Ross, Superintendent of Streets of the city of Newton, Mass., and late President of the Massachusetts Highway Association, in a paper read before the Good Roads Convention of the County Supervisors of New York State, said that in his judgment the time is not far distant when all macadam pavements in the country will be covered with a compound of bitumen and stone.

WOOD PAVING IN ENGLAND AND AMERICA

Wood Pavements in London—English Cities Experimenting Largely with American Red Gum—Superior Material and Methods Used in This Country

By F. A. Kummer, C. E.



F. A. KUMMER, C. E.

THE three classes of wood generally used in London, for paving streets, are creosoted deal, Australian hard woods—generally known as karri and jarrah—and American red gum. The different vestry's act, to a large extent, independently of each other and practice, therefore, differs in different sections of the city. The first named wood is rather soft, non-resinous wood, which is readily impregnated with dead oil of coal tar under ordinary pressures and makes a fairly lasting pavement. It is usually laid on a six-inch concrete foundation, although a heavier foundation is sometimes used, and is generally set directly on the surface of the concrete without the use of an intervening sand cushion, the surface of the concrete being brought to grade by means of a floating of Portland cement and sand. The blocks are in dimensions three by nine and either four or five inches deep. In the district of Kensington the latest practice is in favor of the four-inch creosoted deal block. These blocks, creosoted, cost about \$1.50 per square yard, delivered on the work. They are not thoroughly creosoted, having only from eight to ten pounds of oil per cubic foot, which gives a moderate penetration only. In many cases it is evident that this amount of oil is not used, if one should judge by the depth of penetration secured, some blocks appearing to have little more than a surface coating. The general practice in the past has been to lay these blocks with a one-quarter-inch joint between them, this joint being afterwards filled with paving cement or fine gravel and pitch. In some cases no effort is made to treat the blocks under pressure and they are simply dipped into boiling creosote oil and pitch.

THE OPEN JOINT IS GOING OUT OF USE

The practice of laying the blocks with an open joint, as mentioned above, is disappearing in English practice. I quote from an article on the construction of roads, etc., by Mr. Frank Latham, C. E., Borough Engineer and Surveyor of Penzance, which article was published in the Sanitary Record and Journal, of London, under date of January 2, 1902. Mr. Latham says:

"Close blocking is to be recommended in preference to the system of close pointing in all descriptions of wood pavements. Wide joints have been adopted to a great extent, but the system is fast dying out. Such pavements, after a short period of wear, become quite uncomfortable to travel over, owing to the jointing material wearing down below the surface of the pavement and allowing the arris of each row to be worn and knocked off. The

Mr. Frederic A. Kummer, C. E., the author of this paper, on "English and American Practice in Wood Paving Compared," is Treasurer and General Manager of the United States Wood Preserving Company, of 29 Broadway, New York, and is an expert on paving questions. Mr. Kummer has been identified with street paving for a number of years and was for a time General Manager of The Eastern Paving Brick Company, of Catskill, N. Y. He is the author of "Vitrified Brick for Street Pavements" and of "Modern Wood Pavements," and has been a frequent contributor to the technical press. There is probably no man in the United States who is better posted on the question of wood paving. His papers before the American Society of Civil Engineers, the American Society of Municipal Improvements, and the League of American Municipalities, with which he is connected, have attracted great interest to wood pavements. Mr. Kummer is also a member of the American Society for the Advancement of Science.—[EDITOR.]

wear of the material itself appears to be also affected by this method; not only do the arrises become damaged, but the fiber of the wood has a greater tendency to spread and disintegrate under the traffic, affording greater facilities for absorption causing greater amount of expansion, and the material to become saturated to a large degree with unsanitary matters."

The greatest objections to the creosoted Swedish deal have been:

First the imperfect nature of the preservative treatment employed, Second, the soft spongy nature of the wood; Third, the tendency of the pavement, owing to its soft spongy nature, to become very slippery, because of the upper ends of the fibers of each block brooming down and presenting a difficult foothold for horses. For this reason the creosoted deal pavement is very largely sanded, or covered with a layer of fine gravel, to prevent its being slippery.

THE INTRODUCTION OF AUSTRALIAN HARD WOODS

Some ten or twelve years ago, a very extensive use of the Australian hard woods was begun. These blocks were laid untreated. The wood is much harder and denser than the creosoted Swedish deal.



CREO-RESINATE WOOD PAVEMENT IN THE MAIN DRIVEWAYS AT THE PLANT OF THE BROWN AND SHARPE MFG. CO., PROVIDENCE, R. I.

As a rule, the blocks were dipped in melted pitch before being set in place and were generally three by nine by five. When first laid they made a very excellent pavement. The chief difficulties with them seem to have been: First, the wood being very hard, had a tendency to be somewhat slippery; Second, because of the wood being untreated, there was considerable decay in the individual blocks after a time, especially in those blocks which were most porous, and although very large quantities of Australian woods have been used in London, they are not now in great favor and in some districts creosoted Swedish deal blocks are being substituted upon streets paved with the above named woods. The cost of the Australian woods, even though untreated, is considerably greater than that of the creosoted deal, and, as has just been stated, the wear is much more irregular. It was also found that the tendency of the Australian woods to expand and contract was very great, as would naturally be expected of an untreated block; therefore, wide expansion joints were used which re-



STATE STREET, BETWEEN HENRY AND HICKS STREET, BROOKLYN, N. Y., LAID WITH CREO-RESINATE WOOD BLOCKS IN 1902

sulted in great rounding of the corners of the block and a consequently uneven surface for travel. These depressions between the blocks collect dirt and make the pavement unsanitary. Mr. Thomas Aitken, Associate Member of the Institute of Civil Engineers, in his work on road-making and maintenance says with reference to jarrah wood:

"The liability to contraction, however, is an objection, and when it takes place the spaces between the blocks are filled up with deleterious matter which cannot be removed." He says further, "The wide joints left on contraction disintegrate at the edges under hoof and wheel traffic and cause a corduroy and dirty surface."

AMERICAN RED GUM

Some five years ago the use in England was begun of red gum, which is found in large quantities throughout the southern part of this country. This wood had been of little value for lumber purposes on account of difficulties experienced in seasoning it. It has been quite extensively used in London during the past five years and is laid on Whitehall, Piccadilly, The Haymarket, and the streets in front of the House of Parliament, and, indeed, in many other important thoroughfares in London. The red gum seemed to present to English engineers a solution of the paving problem inasmuch as it is a considerably more durable wood than Swedish deal and at the same time, although hard and tough, is not as hard as the Australian woods. They made a great error, however, in laying this wood untreated. When first laid it appeared to wear very well, but later developed those defects which all untreated paving blocks must ultimately develop, namely, the beginning of decay and wear in the softer portions of the blocks, and a consequently irregular surface. At the same time the wood has given good general satisfaction, but is not now used to so great an extent, owing to the fact that a method of seasoning it has been arrived at and the wood has now a high value in furniture making and other kindred uses.

It has long been recognized abroad, especially in England, where wood pavements are almost exclusively used, that long leaf yellow pine,

commonly known as Georgia pine, is the best material for use in the manufacture of paving blocks, but its high price has prevented its extensive use abroad. Such a block, cut from the heart of the tree, without sap wood, is very uniform in its texture. Treated throughout its mass so as to become proof against decay and also thoroughly waterproof, a result which is secured by methods now in use in this country, such a block has been shown by actual service tests to wear with almost perfect uniformity, which is in the end the great necessity in all paving materials. Such a block is far superior in every way to any form of wood paving material which has been used in the foreign practice, its superiority arising: First, from the superior character of the wood employed; Second, from the thoroughness with which the wood is treated, so that it is both decay proof and water proof; Third, from the resulting even and regular wear.

IMPROVED METHODS AND MATERIALS USED IN AMERICA

The American practice with respect to laying paving blocks was at first similar to the English practice, the blocks being laid

with a wide joint, and many cases of failure of wood pavements can be traced to this mistaken method of laying. During the past three or four years, however, the American practice has changed so that wood pavements are now laid on a thoroughly well constructed concrete foundation with absolutely tight joints. In the case of the ordinary creosoted blocks, which are not waterproof, expansion joints are generally left along the curb and in some cases across the roadway at intervals, but in the case of the blocks treated with the process to which I have above referred and which is called the creo-resinate process, no expansion joints have been used in any of the streets paved with this material during the past four years. This is due to the fact that wood pavements, unlike brick pavements, do not expand under heat; their only expansion arising from absorption of water and consequent swelling of the wood. It is, therefore, evident that



CREO-RESINATE WOOD BLOCKS ON PEARL STREET BRIDGE, GRAND RAPIDS, MICH.

a block which is so treated as to be thoroughly waterproof, and which consequently does not absorb any water, does not swell and therefore expansion joints become unnecessary.

It is interesting to note the weight of traffic on many of the important English thoroughfares paved with wood. On some of these streets the traffic equals 40,000 teams per day and over. Mr. Blair, Surveyor for St. Pancras, London, in speaking of one of the important London wood paved thoroughfares says:

"The results (from a report of the traffic during seven days in July, 1895) showed that during seven days 110,977 tons of traffic passed along this portion of the road, equaling 5,770,800 tons per annum, or 575,544 tons per yard of width per annum and 7.72 per cent. of the total traffic was omnibus traffic."

WEARS WELL UNDER HEAVY TRAFFIC

The records of traffic on many important thoroughfares of London and also of Paris and many other English and Continental cities, show an enormously greater traffic than is found on any of the streets in this country. One of the heaviest traveled pieces of roadway in the United States paved with wood blocks, is found on Tremont street in Boston, where a careful examination of blocks which had been down two years showed that the wear over the street was uniform and about one-sixteenth of an inch per year, which would give a life of sixteen years to each inch of the block, which is a far better result than has ever been secured with any other form of paving material in this country under heavy traffic. These blocks were treated

with the improved creosoting process above referred to. An example of ordinary creosoted blocks under heavy travel may be found on the Rush Street Viaduct in Chicago. Figures furnished by the Engineering Department of that city show that the traffic approximates 10,000 teams, vehicles, etc., per day, and after four years of service an examination showed that the rate of wear on the blocks was about one-eighth of an inch per year. This pavement was laid on only one-half of the bridge, the second driveway being paved with untreated blocks, which wore completely out during the same period.

Some other important thoroughfares in this country laid with wood blocks are, Beacon Street, Boylston Street and Newbury Street in Boston; the Harvard Bridge, 12,000 square yards, between Boston and Cambridge, carrying a very heavy traffic; Main Street, Springfield, Mass.; State Street, Brooklyn, N. Y., and the Washington Avenue Bridge in that city, and a large number of less important streets and bridges, as well as many miles of well constructed streets in Indianapolis, Toledo and other western cities.

A recent important use of wood pavements has been in their selection for paving the main driveways of a very large and important manufactory in Providence, R. I. (the Brown & Sharpe Manufacturing Company). These driveways carry extremely heavy traffic, all the coal, limestone, iron, etc., which is brought into the works, going over them, and wood pavement was selected against all other forms of roadway as the best adapted for this traffic.

It is the opinion of the writer that properly constructed wood pavements have a serviceable durability equal to that of granite.

CHICAGO'S STREET RAILWAY SITUATION

THE city of Chicago has been considering the problem of a subway for rapid transit for several years, such as is in operation in Boston and as is nearing completion in New York. According to the calculation of Mr. Bion J. Arnold, who made the investigation as to the proper method to solve the transit problem, the population of Chicago will reach the number of 13,250,000 by 1952, and provision must be made for enlarging any subway that would be built. He found that the problem of rapid transit in New York is much different from that in Chicago on account of the way the city is laid out and, while all the systems in New York earn about \$13 per capita, with a milage of 393, in Chicago the surface and elevated combined cannot earn more than \$10 per capita, with 610 miles of track.

There are two sources of danger in underground railways—the combustibility of cars and the possibility of fatal shocks from the working conductor rail after an accident. Cars must be secured that will not catch fire. To avoid the latter danger, the working conductor, either overhead or underneath, should be divided into sections each with suitable cut-off switches which will open automatically in case of a short circuit on any section and which can be operated by tower men or station employees.

Mr. Arnold makes two recommendations as to future subway systems. The first plan calls for three north and south tunnels on a high level and two subways entering the business section from the west side. The second plan calls for these north and south tunnels in connection with three or more low level lines crossing under the higher ones and connected by stairways and elevators. The cost of the first system would amount to \$16,000,000 and that of the second \$20,000,000. Mr. Arnold prefers the latter idea. Whichever plan is adopted, certain rules must be enforced. No subway is to be built so that through-route cars cannot be run. Provision should be made for expanding each subway or connecting them. There should be a street surface system connecting the stations and designed to handle short haul traffic in the business districts. The cost of a complete and new system of combined subway and surface system of railways, is placed at \$85,800,000 including the first plan, or \$90,000,000 with the second plan. The cost of a mile of underground track is placed at \$81,300 exclusive of the cost of rolling stock, power and paving. The actual present values of the properties of the Chicago City Railway Company and of the Chicago Union Traction Company are \$12,000,000 and \$15,000,000 respectively.

The unsatisfactory condition and multiplied fares are ascribed primarily to the diversity of ownership of the transportation corporations. A consolidation of management must be precedent to any satisfactory solution of the problem. One fare throughout the city limits is the one feature of any plan to be considered. The people have the right to demand that they be transported through the city in one general direction for one fare with as little inconvenience as practicable upon the use of transfers.

Mr. Arnold advocates the running of single cars in place of trains. Two or more cars decrease the frequency of the cars and increase the number of stops in the ratio that the larger number of passengers on the train bears to the capacity of a single car. More time is required for starting and stopping.

The idea that transfers should be given at all points of intersection permitting persons to ride in any direction they wish, is an abuse of the universal transfer privilege. The universal transfer within a one-fare district should be considered to be a continuous ride in one general direction over the shortest distance between two points.

All pipes and conduits in streets would be placed in galleries to prevent disturbance of the street surfaces. They would be placed beneath the sidewalks. For electric wires and cables for electric light, power, telegraph and telephone, etc., roomy, dry and well ventilated galleries parallel to the subways would be constructed. The galleries carrying the feeder mains would have their floors on a level with the railway tracks in the subway and, according to the plans, would be nine and one-half feet wide and eleven feet high with arched roof which would form the floor of the gallery beneath the street surface to carry the high level sewer and pneumatic tubes. The galleries for the feeders would be placed between the wall of the subway and the curb wall at the outer edge of the sidewalk space. At the stations the wires and cables would pass by in tile conduits underneath the platforms, manholes being at either end of the platform. The conduits would be drained into the low level sewers. Adequate ventilation to be provided by ventilating flues in the curb walls and these would terminate in the sidewalk and be covered by iron bar grates. Between the service main gallery and the building line of the street would be placed the gallery for water pipes, and the space filled with sand which would be devoted to gas mains. Separating these from the upper wire gallery would be a concrete wall.

HOW TO LAY BRICK PAVEMENTS*

**Concrete the Best Foundation—The Sand Cushion, Direction of Courses and Rolling
Important Details—Three Kinds of Fillers—Merits of Brick Pavements**

By Ira O. Baker, C. E.



IRA O. BAKER, C. E.

THUS far in the history of brick pavements, attention has been centered in the quality of the brick, while comparatively little attention has been given to the details of the construction.

FOUNDATION

Each brick should have an adequate support from below, as otherwise the loaded wheels will force it downward and make the surface uneven, a condition which conduces to the rapid destruction of the pavement by the impact of the wheels in passing over the depressions. There are several forms of foundation in common use for brick pavements.

The best foundation is doubtless a bed of concrete. In recent years there has been a marked tendency to use concrete for the foundation of a brick pavement; although a brick pavement should have adequate support, and although concrete when properly made makes an excellent foundation, it does not follow that every such pavement should be laid upon concrete,—at least upon a 6-inch layer, as is the common practice. Under certain conditions a layer of macadam may be cheaper and equally effective, and sometimes a layer of gravel of proper thickness is sufficient. In some localities the natural soil is so gravelly that it needs only to be leveled and rolled to make a reasonably good foundation, particularly if the traffic is only moderately heavy. Many cities, some of which have a considerable traffic, for example, Cleveland, Ohio, and Galesburg, Illinois, thus lay brick directly upon the native soil. Under certain conditions 4-inch macadam roads have given fair service, and a 4-inch course of brick has at least approximately as much stability as an equal thickness of broken stone.

However, it is poor policy to build an inadequate foundation for a brick pavement. The foundation for any block pavement, whether of brick, stone, or wood, should be substantial enough to keep the blocks in position so that the traffic will be received perpendicular to the face of the block since then the surface of the pavement will be smoother and the wear upon the blocks will be less. Brick pavements, being made of comparatively small blocks, are proportionately more injured by any derangement of the blocks, and consequently require a very carefully constructed foundation. The best foundation for any particular work will depend upon the character of the soil and the availability of the various materials.

During the first ten or fifteen years after the introduction of brick pavements in the Middle West, the foundation consisted almost exclusively of a course of bricks laid flatwise on a thin bed of gravel or cinders. Such pavements are generally known as two-course brick pavements. The layer of cinders or gravel was leveled, the inferior paving bricks were laid flatwise thereon; and then the joints of the bricks were swept full of sand. Brick foundations were formerly used very extensively, but recently have generally given place either to concrete, crushed stone, or gravel, and are used now only in few localities which are remote from stone quarries and gravel pits in which brick are comparatively cheap. The chief defect in this form of foundation was that the joints of the lower course were not fully filled, and consequently after the pavement was in service the sand of the cushion coat (the layer between the two courses of brick)

* This article is made up of excerpts from the chapter on "Brick Pavements" in "A Treatise on Roads and Pavements," by Ira O. Baker, C. E., Professor of Civil Engineering, University of Illinois, author of Masonry Construction, Engineers' Surveying Instruments; Member of the American Society of Civil Engineers, Western Society of Engineers and the Society for the Promotion of Engineering Education. This work has just been published by John Wiley & Sons, of New York. It is an 8vo volume with 655 pages, 171 figures, 68 tables, bound in cloth and sells for \$5. By the courtesy of the author and publishers we publish this article on brick, which, it will be noticed, is protected by copyright. (Copyright, 1903, by Ira O. Baker, C. E. All rights reserved.)—[EDITOR.]

would work into these joints and permit the bricks in the wearing course to settle. To cheapen the pavement, broken and chipped brick were used in the lower course, and the tendency was to place the larger face uppermost, thus making it nearly impossible to fill entirely the joints during the time of construction. This form of foundation was abandoned on account of its cost and inferior quality.

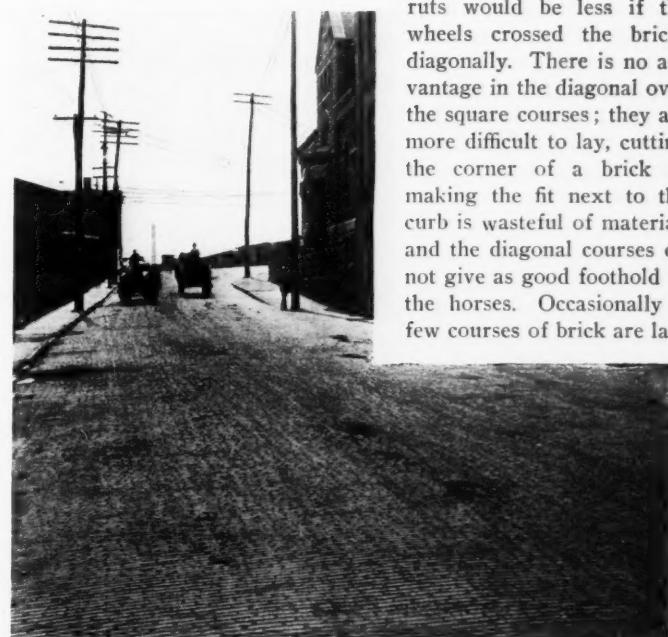
CUSHION LAYER

This is a layer of sand between the foundation and the wearing course of brick, to secure a uniform bearing for the latter. The proper thickness of this layer will depend upon the regularity of the upper surface of the concrete foundation and also upon the uniformity of the size of the bricks. It should be thick enough to give a uniform support to the bricks, and any greater thickness does no particular harm except that it is a little more difficult to spread exactly uniformly a thick layer than a thin one. In common practice, the thickness varies from one-half to two and one-half inches, but usually from one to two inches. A thickness of one inch is enough to fill up all reasonable irregularities of the foundation, but it is not enough to permit a uniform bedding of the brick by rolling. Apparently a one-inch cushion is not thick enough to permit the sand to flow sufficiently to adjust itself to the inequalities of the brick. Unless the blocks are unusually uniform, the cushion layer should be two inches thick.

DIRECTION OF COURSES

It is customary to lay the brick with the length perpendicular to the curb, except at street intersections; but there are a few cities in which the brick are laid in courses making an angle of 45 degrees with the length of the street, with the idea that the tendency to form

ruts would be less if the wheels crossed the bricks diagonally. There is no advantage in the diagonal over the square courses; they are more difficult to lay, cutting the corner of a brick in making the fit next to the curb is wasteful of material, and the diagonal courses do not give as good foothold to the horses. Occasionally a few courses of brick are laid



WEST WATER STREET, SYRACUSE, N. Y.—PAVED, 1890; PHOTOGRAPHED, 1902

longitudinally in the gutter, similar to the practice with stone blocks; but this is unnecessary, since the brick pavement is much smoother than the ordinary stone-block pavement, and besides the running joint where the transverse and the longitudinal sections join is likely to develop into a rut.

At street intersections and junctions the bricks should be laid diagonally—a compromise position between the directions of the travel on the two streets. Street intersections need special care in construction, since they are exposed to the traffic of two streets.

ROLLING

After all rejected brick have been removed and the pavement has

been swept, it is ready for rolling, which should be done with a steam roller weighing from three to six tons. A horse roller is undesirable, since the horse's feet disturb the position of the loose brick, and also since it is impossible to roll the street transversely. The purpose of the rolling is to settle the bricks uniformly into the sand bed, and therefore a steam roller of the asphalt type is better than one of the stone-road type. A very heavy roller is undesirable, at least in the beginning of the rolling, since the first passage of it tilts the brick to one side so much that it is nearly impossible to



SOUTH SALINA STREET, SYRACUSE, N. Y.—PAVED, 1891; PHOTOGRAPHED, 1902

straighten them up again. The roller should not weigh more than six tons, and four tons is better. Unless the top faces of the bricks are brought to a plane, the pavement will be rough and noisy, and will lack durability. The bricks should be firmly settled into the sand bed so that traffic may not depress some of the brick, which will make the pavement rough and also make it wear needlessly fast.

The pavement should first be rolled longitudinally, beginning at the crown and working toward the gutter, taking care that each return trip of the roller covers exactly the same area as the preceding trip so that the second passage of the roller may neutralize any careening of the brick due to the first passage. Pavements that have been rolled only once or always in one direction, are very much rougher and more noisy than when properly rolled. If a spot is skipped on the return passage of the roller, it can be detected by a casual inspection or by the noise of a passing vehicle. The first passage of the roller should be made at slow speed, not faster than a slow walk, to prevent undue canting of the brick. After the pavement has been rolled longitudinally, roll it back and forth transversely, or at least in both directions at an angle of forty-five degrees from curb to curb.

If the rolling is well done the sand cushion will be pushed up between the brick one-eighth to three-eighths of an inch.

FILLING THE JOINTS

The joints should be filled (1) to keep the brick in the proper position, (2) to lessen the chipping of the edges of the brick, and (3) to prevent water from penetrating to the cushion coat and to the foundation. Three forms of filler are in common use, viz.: sand, tar and hydraulic cement.

SAND FILLER

Sand was the first filler employed for brick pavements, and in the Middle West is even yet almost exclusively used. The sand should be fine and dry, and be worked into the joints by sweeping it over the pavement, which also should be dry. A few cities specify that the sand shall be heated to dry it, before being swept into the joints. Although the sand is nominally always swept into the joints, it is usually simply spread upon the surface and left to be worked in by traffic, which is undesirable since the joints are then partially filled with manure and street dirt. The sand can be swept into the joints effectively and economically with a revolving machine sweeper. After the joints have been filled, the surface of the pavement is covered with a layer of sand one-quarter to one-half inch thick, which is left on for a few weeks after the street is thrown open to traffic, to secure the thorough working down of the sand into every joint. The cost of sweeping the pavement and filling the joints with sand is 0.15 to 0.25 cent per square yard, and the cost of a one-half inch layer of sand at \$1.08 per cubic yard is 1.5 cents per square yard.

To cover waste and contingencies, the sand joint filler is usually estimated at 2 cents per square yard.

The advantage of a sand filler are: 1. It is cheap, usually costing about 2 cents per square yard. 2. The pavement may be thrown open to traffic as soon as the bricks are laid. 3. The pavement may be taken up easily and without breakage of the brick. 4. It is practically water tight, particularly after being in service a short time. Whenever a brick pavement having a sand filler is opened, the sides of the brick are always found dry and clean a little distance below the wearing surface.

The disadvantages of a sand filler are: 1. It does not protect the edges of the brick from chipping. 2. It may be washed out on steep slopes. 3. It is removed from the top of the joints by the street sweeper—either the broom or the pneumatic.

TAR FILLER

A No. 5 or No. 6 coal-tar distillate is often used as an interstitial filler for brick pavements. The bricks should be dry, and the tar should be applied at a temperature of 300° to 320° Fahr. by being poured into the joints with a vessel very much like a sprinkling pot without the rose. The success or failure of the tar filling depends on the efficiency and care of the person in charge of heating the tar. If the tar be too hard, it pulverizes in very cold weather; if it be too soft, it runs and becomes sticky in very hot weather.

The cost depends upon the locality and the closeness of the joints. Usually tar costs from 6 to 8 cents a gallon; and one gallon is generally sufficient for one square yard of pavement. The total cost of the filler varies from ten to twelve cents per square yard of pavement.

Tar is superior to sand in that it makes a perfectly water-tight joint, and it is superior to hydraulic-cement grout in that it is not so rigid and therefore makes a more quiet pavement. Tar costs more than sand, and does not protect the edges of the brick as well as hydraulic-cement grout.

The objections to tar are: 1. In summer it is likely to melt and run out of the joints; and in winter it is brittle and likely to chip out of the joints. 2. The heating of it makes unpleasant odors on the street.

CEMENT FILLER

The most common joint filler, other than sand, is a thin mortar composed either of neat Portland cement or of one part cement and one part fine sand, the latter proportions being the most common. The pavement should be copiously sprinkled immediately before the grout is applied. The sand and cement should be mixed in batches say, of not more than forty or fifty pounds each at one time, in a



SOUTH WEST STREET, SYRACUSE, N. Y.—PAVED, 1893; PHOTOGRAPHED, 1902

tight mortar box. The box for this purpose should be three and one-half to four feet long, twenty-seven to thirty inches wide, and fourteen inches deep, and should have legs of different lengths, so that the mixture will readily flow to the lower edge of the box, which should be eight to ten inches above the pavement.

The sand and cement should first be mixed dry, and when the dry mixture assumes an even and unbroken shade, water should be added

in a sufficient quantity to form a grout of the consistency of thin cream. The grout should be removed from the box to the pavement with a scoop shovel, and not by overturning the box upon the pavement; since by the last process the sand, cement, and water are separated, and are deposited in different portions of the pavement. While the box is being emptied, the grout should be constantly stirred to prevent a separation of the sand from the cement; and after the grout has been applied to the pavement, it should be quickly swept into the joints with steel brooms. It is better that the joints should be only about half filled at the first application, since then there is a less depth of grout in the joints and consequently less liability of the separation of the sand, the cement, and the water.

To secure the best results, a mortar box should be provided for each ten feet of width of street, and the full width of the street should be filled at practically the same time. After the filling has been carried forward for forty or fifty feet, the same space should be filled again in like manner, except that the mixture for the second filling should be slightly thicker than the first. The joints should be filled entirely to the top in the second application. After the joints have thus been filled, a half-inch of fine sand should be spread over the entire surface of the pavement; and if the weather is very hot or dry, the sand should be sprinkled at intervals for two or three days, to insure the cement does not lose by vaporization the water

necessary for chemical combination in setting. Traffic should be kept off the pavement from seven to ten days, or at least until the cement has firmly set. If the cement filler is disturbed before it is fully set, it is practically no better than sand. If the cement filler is put in as described above and allowed to set firmly before being used, it will wear no faster than the best paving blocks and will prevent spalling and chipping of the bricks at the edges and corners.

Bricks as a paving material have some attractive features. 1. They may be had in small units of practically uniform size. 2. They may be had in large or small quantities. 3. They may be laid rapidly without special expert labor. 4. When ailing pipes or other causes necessitate the disturbance of the pavement, ordinary tools and intelligence can restore the original surface. 5. Brick pavements give a good foothold for horses. 6. They do not wear slippery. 7. They are adapted to all grades. 8. They have low tractive resistance, particularly if the joints are filled with Portland cement grout. 9. They are not specially noisy when properly laid. 10. Brick pavements yield little mud or dust. 11. They are easily cleaned. 12. If the joints are filled with sand, they are only slightly absorbent; and if filled with tar or cement, they are non-absorbent. 13. Brick pavements have a pleasing appearance. 14. They are very durable, particularly if the joints are filled with Portland cement. 15. They are easily repaired.

PAVEMENTS FOR SMALL CITIES

Macadam Widely Used—Methods of Construction—Economy in Using Modern Machinery, as Demonstrated by County Road Commissioner of Michigan

By F. F. Rogers, C. E.

A MUNICIPAL officer is seldom called upon to exercise better judgment than that required in selecting suitable pavements for the various roads and streets in his care. The chief requisite of any good street, whether it be located in the country, in the village, or in the

must receive more or less weight in the choice of an ideal street, bearing in mind the requirements of the special kind of traffic the street must sustain, as well as the special needs of the neighborhood in which it is located.



SPREADING THE STONE PREPARATORY FOR ROLLING

congested districts of a large city, is that it be always smooth and hard—but not slippery—thus offering the least possible resistance to all kinds of vehicles, with all kinds of loads in all kinds of weather. A number of other qualities are desirable, such as an impervious surface, freedom from dust, mud and noise, all of which

After all of the above requirements have been given due weight, a conscientious officer often finds that the kind of pavement best adapted for a given road, or street, is too expensive and that a compromise must be made between the one most suitable and the one which available funds will pay the cost of building.

In small towns the latter consideration is of great importance, for it is very easy to expend as much, or more, in the construction of a pavement than could be realized from the sale of the bare land on both sides of the street to be paved. Many heavily travelled roads enter small towns bearing a traffic which can be kept out of the mud by nothing less than modern pavement on the most substantial foundation, while the property on the margins of such towns would beg for buyers at \$2.00 per foot front, thus making it impossible to construct any of the more expensive pavements unless a large general fund can be drawn upon to supplement the special taxes that can be raised on abutting property.

It is not our intention, however, in this article, to deal with such pavements as are required in the business districts of the small cities and prosperous towns, conceding that such pavements will be built of materials which do not properly enter this discussion.

It is our object rather, to call attention to the numerous streets in all towns and small cities away from the main line of travel and the main roads entering these towns beyond the business districts, where the value of property will not warrant the more expensive

When the road bed is ready to receive this stone covering, the spreading wagons are coupled to the roller, forming a train of three or four wagons, drawing from ten to fifteen cubic yards (fifteen to twenty-two tons) of stone and hauled under the elevator chutes, where the wagons are loaded by gravity, the stone sliding into them directly from the crusher bins. After the train is loaded it is drawn to the road, or street, with the roller where the stone is spread automatically, four and one-half feet wide and to any desired depth without any hand labor after leaving the crusher. The wagons are provided with broad wheels, the front wheels being six inches wide and the rear wheels ten inches wide, so that both the roller and the wagons continually improve the road over which the stone is hauled, making it possible to haul larger loads as the work progresses. This fact also makes it possible to begin the pavement at the end nearest the stone supply, extending outward with the completed work, just the opposite of what is commonly specified. By working in this way, every load of stone that is hauled to the road helps to consolidate the stone previously applied so that the road is constantly growing better and the sub-grade becoming firmer as the



THE ROAD ROLLER AT WORK

kinds of pavements. In such places well constructed macadam streets surfaced with granite or trap rock, if substantially and economically built, are universally conceded the most desirable.

POPULARITY OF MACADAM PAVEMENTS

That such pavements are appreciated and much used in New York and the New England States cannot be denied, especially in Massachusetts, where we are told that 200 miles of macadam streets have been built in Boston's immediate suburbs and 240 miles in Boston proper during the last eight years; while Greater New York has over 800 miles of macadam, nearly all built since 1894.

Most cities and towns in the Central West have not kept pace with the East in this respect, due partly to the scarcity of the better grades of road building stone, but largely to the general impression that well built macadam streets are a luxury, suitable principally for boulevards and other streets devoted principally to pleasure driving.

The purpose of this article is to explain the use of some comparatively new machinery, by which the labor of preparing the road bed and putting the metal in place, including hauling, spreading and rolling can be materially reduced, thus placing this desirable kind of pavement within reach of many municipalities, which otherwise might be doomed to mud.

work progresses, instead of being cut to pieces as is usually the case when stone are hauled to the street with teams in ordinary wagons.

DIFFICULTIES FOUND IN BUILDING MACADAM ROADS

This method of spreading places the stone on the road uniformly mixed. Builders of macadam roads and streets have found that uniform spreading is one of the most difficult things to secure, especially where (mill run) stone is used, and this kind of product has many intelligent advocates. When the stone are poorly spread the street resembles patch work, being composed of irregular groups of fine and coarse stone causing the street to soon become rutted.

To avoid such results the Massachusetts Highway Commission requires all the stone to be dumped on wooden platforms placed just in advance of the graded stone and all the stone shovelled from these platforms by hand so as to insure a perfect mixture. The importance of this thorough mixing will be more fully realized when we remember that all stone used on the state roads of Massachusetts are thoroughly screened and graded before leaving the bins at the crusher.

The cost between the crusher and the completed road will ever be a large one at best. The cost of the raw material is fixed by

supply and demand in every locality and cannot be materially changed by the skill of man, no matter how he tries. It is therefore the labor cost of preparing the material, preparing the road bed and applying the stone to the road to which we must look for cheapening the cost of modern streets and roads. Our grandfathers could afford to reap with a sickle and mow with a scythe, but any man who attempts to raise and harvest grain by these antiquated methods in competition with self binders and other modern machinery will make a dismal failure. Competition is sharp along all lines and any municipality that desires its full quota of public improvements must husband its resources and make the always limited means at its disposal purchase these utilities to the fullest extent possible.

ECONOMY IN USING MODERN MACHINERY

How much can be saved by modern machinery of this kind over ordinary methods will always depend on how well the work is organized and managed as well as the local conditions.

At Port Huron, Mich., on October 22, 1901, one roller and five wagons delivered seventy-six cubic yards (over 100 tons) of crushed stone to a road three-fourths of a mile from the crusher in one day.

To arrive at the cost of this kind of work to a contractor or municipality, we will assume that a roller and five wagons can be purchased for \$2,500.; this will give a machinery cost as follows:

Interest on \$2,500.00 at 6 per cent.....	\$150.00
Depreciation at 10 per cent.....	250.00

Total machinery cost per year.....	400.00
Assuming that the working season is but 100 days we have:	
Machinery cost per day.....	\$4.00
Labor cost per day, engineer.....	2.50
Helper on train.....	1.50
Fuel and oil.....	3.00

Total cost per day.....	\$11.00
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On this basis the cost, per cubic yard, delivered from bins of crusher and spread on the road, is a little less than 14½ cents, a cost that cannot be approached by ordinary methods of team hauling.

H. H. Eymer, C. E., County Road Commissioner of Saginaw, Mich., purchased a road building outfit of this description in 1902, and after using it on several pieces of road made the following interesting comparison of the cost of machinery and team hauling, in a report to his board of supervisors at the October session of the same year. He says:

COST BY MACHINERY

Cost per day, engineer.....	\$2.50
Coal	3.00
Oil50
Depreciation	1.00

Total cost per day.....	\$7.00
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The haul was nearly two miles and forty yards of stone were delivered to the road in a day at a cost of, practically, 17½ cents per cubic yard.

COST BY TEAM HAULING

Cost of team per day, \$3.50. Each team hauled eight cubic yards of stone to the road in a day at a cost of, practically, 43¾ cents per cubic yard, showing a net saving by machinery over team hauling of 26¼ cents per cubic yard.

The hauling was done over a clay road in poor condition, teams and engines passing over the same road, and it will be noted that a saving of 60 per cent, on the cost of team hauling was made by using the machinery.

At Greenville, Mich., a sample one-half mile of road was built last July, under the joint auspices of the Michigan Highway Commission and the Office of Public Road Inquiries, Washington, D. C. A road building outfit similar to the one illustrated on these pages was used. The road built was on an old gravel road bed, which rested on a sand foundation. The road was found in excellent shape and only needed a thin surfacing with stone. Stone was applied to a depth of four inches and to a width of nine feet.

Fifty cords of cobble stone (350 tons) had been collected in a pile at one end of the road to supply the material. These were crushed, delivered upon the road, with a suitable amount of stone screenings for binder, sprinkled and rolled till a perfect surface was secured at a total labor cost of \$194.50.

These examples are cited to show what may be done with modern street building machinery, under average conditions, if properly managed, for the benefit of many cities and towns which heretofore have found it impossible to suitably maintain their residence streets. Most municipalities can find a supply of very good road building material within a reasonable railroad haul, and, by using suitable machinery, would find it easy to improve their many side streets and main highways in a pleasing and permanent manner and, at a cost well within their means.



THE FINISHED ROAD READY FOR USE

COAL TAR PAVEMENTS*

Some of These Pavements Are Over Thirty Years Old—Remarkably Low Cost for Repairs—
Methods of Construction

By Allan Wade Dow †



PROF. A. W. DOW

SINCE the introduction of Bituminous Macadam Pavement, the questions have often been asked, Can coal tar be relied upon to furnish a reliable paving cement, and if so how is it this class of pavement has obtained such bad reputation in the past? The only way to answer these questions with satisfaction is to look back over the records of coal tar pavements, and study the character of their ingredients, the methods used in their manufacture along with their cost of maintenance.

There is no city that offers a better opportunity for this study than Washington, D. C. It is said that in the early seventies, there was hardly a patented pavement proposed that was not tried during the earnest endeavors of the government to find a desirable substitute for the miserable rubble stone pavements, that made driving in our National Capital unendurable.

Between the years 1871 and 1877, there were laid in all 741,412 square yards of what was known as "coal tar concrete pavements." These pavements were laid under various patents, but consisted essentially of a bituminous concrete base, composed of broken stone either sprinkled or coated with coal tar, and a wearing surface of varying thickness and composition, according to the patent under which it was laid. In all the pavements, some coal tar was used either crude, or partly refined, or mixed with some other ingredients, according to the formula. In a few of the pavements a small percentage of asphalt was used with the coal tar. The original coal tar concrete pavements were designated by the following names:

Evans (Snow and Davis' patent No. 96,988).....	187,271 sq. yds.
Vulcanite (Filbert's patent, No. 120,956).....	180,240 sq. yds.
Parisen (Parisen's patent, No. 115,887).....	66,487 sq. yds.
Taylor (Secret process).....	26,134 sq. yds.
Scharf (Scharf's patent, No. 111,151).....	191,401 sq. yds.
Abbott (Abbott's patent, No. 112,764).....	87,018 sq. yds.
Bailey (Bailey's patent, No. 97,139).....	2,861 sq. yds.

It will be seen, after reviewing these patents, that in the great majority of cases the contractors were ignorant of the character of the materials they were working and of the requirements of a desirable pavement.

The pavements under the Snow and Davis patent, laid by C. E. Evans, were more extensively used than any other in 1871 to 1873. The formula prescribed in this patent is so novel that I will quote here rather fully:

"The constituents of the composition and the proportion thereof, may be stated as follows: Fifteen bushels of sand or fine gravel, three bushels of wood sawdust, forty gallons of coal tar, (it being preferable to have tar in heated state) one quart of sulphuric acid. The sand, sawdust, coal tar and sulphuric acid are well mixed together to form the composition. The addition of resin improves the compound for certain purposes. We do not confine our invention to the precise proportions of the ingredients as stated, as they may be

* Some interesting statistics about the cost of repairs on coal tar pavements will be found on page 129 of this issue.—[EDITOR.]

† Prof. Allan Wade Dow was born in New York City in 1866. He graduated from the school of mines, Columbia College, New York, in the course of chemistry, receiving an Honorable Fellowship, Quantitative Analysis, School of Mines, Columbia College, 1888 and 1889. Almost immediately he entered upon the work of his profession, becoming the first assistant chemist of the Barber Asphalt Company, New York, in 1894, in which year he was appointed Inspector of Asphalt and Cement for the District of Columbia, which position he now holds. Mr. Dow has devoted much time to independent study of the asphalt and bituminous paving industry and is looked upon as an expert in his field. His recent announcement that Trinidad asphalt, so long named as a standard of quality, was unfit for use in the construction of asphalt pavements, except as it was freed from its soluble salts, has excited wide comment among those interested in street pavements.—[EDITOR.]

varied more or less, as circumstances may require; but we found the proportions as above cited to be productive of good results. In our patent No. 61,898 we claim a composition consisting of wood sawdust, gravel or mineral matters, sulphuric acid and the residuum from coal tar by distilling therefrom the water and naphtha. A distinctive difference between the subject of such patent and our present invention is that we do not make use of the tarry residuum, but use the coal tar without subjecting it to the process of distillation. We do not remove from the tar its water and naphtha and therefore use it practically in its normal state; and we have discovered that when it is in such a condition the addition to it of sulphuric acid produces very different effects or results from what follow from the addition to it of any other acid, as oxalic acid, for instance, that is to say, we have found that the sulphuric acid will operate to deodorize the coal



NO. I.—HIGHLAND TERRACE—COAL TAR PAVEMENT LAID IN 1873—
AVERAGE ANNUAL COST FOR REPAIRS, PER SQ. YD. SINCE
LAID, ONE-HALF CENT

tar, or remove from it the offensive smell resulting from the naphtha or other matters contained in the tar. The acid also hardens or thickens the tar, or overcomes much of its unnecessary adhesive properties, thus preventing the composition, when in use as a pavement, from sticking to the shoes of persons or to carriage wheels. Sulphuric acid, when mixed with the coal tar, raises its temperature, and thereby facilitates the admixture or connection of it with other ingredients. It also serves to neutralize a dead oil or substance in the coal tar which, were the coal tar not treated with the acid, would, after exposure to the air, dry away or pass off, and leave the composition brittle and easily crumbled.

"The tarry residuum is more expensive than the coal tar, and besides, is too hard for some purposes.

"The sulphuric acid seems to dissolve more or less of, or so operates on the sand as to cause it to mix to better advantage with the tar, it also chars and colors the wood sawdust to advantage.

"The water and naphtha, being left in the tar aid in rendering the composition more plastic and enable more of the sawdust and mineral matters to be used, and thus increase the amount of composition that can be made with a given weight of tar."

Of the 187,271 square yards laid according to this formula, in 1872 and 1873, 158,000 square yards were resurfaced within two years. As might have been naturally expected these pavements disintegrated by grinding away. The sawdust was eliminated from the formula after one or two of the earliest pavements were laid. That all of the Evans' pavements were not ruined, I believe is entirely due to the good judgment displayed by foreman, Mr. John Grant, now President of the Grant Paving Company of Omaha, Nebraska. Mr.

Grant noticed that the addition of the sulphuric acid to the hot tar causes considerable fuming and supposing that all the acid was volatilized, he tried some mixtures without, to save the expense of the acid. He noticed that these mixtures were entirely too soft, so he hardened the tar somewhat by giving it a crude refining by heat after adding it to the gravel and sand. It is owing to Mr. Grant's good work that I am able to present to you the pictures of Highland Terrace and Massachusetts avenue, laid by Mr. C. E. Evans in 1873.



NO. 2.—MASSACHUSETTS AVENUE COAL TAR PAVEMENT LAID IN 1873—
AVERAGE ANNUAL COST PER SQ. YD. FOR REPAIRS, SINCE LAID,
ESTIMATED AT LESS THAN ONE CENT

Highland Terrace has cost for repairs on an average, \$0.005 per square yard per annum. It has been estimated that the Massachusetts avenue pavement has cost for repairs, on an average, less than \$0.01 per square yard per annum. But few of the C. E. Evans pavements were laid later than 1874.

Pavements under the Scharf patent were first laid in 1872, using the following formula: Hard coal tar pitch is mixed with some of the last running of the heavy oil when coal tar is distilled into pitch. Broken stone, or other suitable materials, are coated with this mixture while hot and then a layer of from four to seven inches put down and rolled until compact on the foundation already prepared. Next is put down a layer from one to two inches of broken stone heated and then mixed with a hot cement of coal tar pitch. After this there is put on a layer about two inches thick of fine gravel and carbonate of lime, thoroughly mixed and coated with the above described pitch.

The patent prescribes either the use, or the omission, of asphalt, mixed with the coal tar pitch for the cement of the wearing surface, but prior to 1875 none was used. The pitch used in the wearing surface was made by distilling coal tar over a slow fire, the distilling being continued as long as possible without burning, or rendering the bitumen brittle.

This class of pavement did better than those laid by C. E. Evans, but very few of them lasted longer than five or seven years. As might have been expected, the pavements ground away under traffic, as the bituminous cement was too hard. By a fortunate digression from the usual formula, some pavements were laid with a softer coal tar pitch, with the result that one of these is still in good condition to-day. This pavement is on Nineteenth street, between E street and Pennsylvania avenue, Northwest (see illustration No. 3) and has cost on an average \$0.011 per square yard per annum.

The first Filbert Vulcanite pavement was laid in 1871. The formula prescribed in the patent was a bituminous base, composed of coal tar pitch and stone. The wearing surface was made by mixing heated mineral matter with a mixture of eighty pounds of asphalt, thirty pounds of coal tar pitch and five pounds of sulphuric acid, or ten pounds of sulphur could be used in place of the acid and some slack lime. The majority of these pavements were too hard and dry and the sulphur (which was more extensively used than the sul-

phuric acid) hardened the bitumens too much. Had the patented formula been adhered to, complete failure would have been the result, as it was some few of these pavements lasted fifteen years or more.

The first pavements supposed to have been laid under the Abbott patent was in 1872. The bituminous cement used in these pavements was hard coal tar pitch, mixed with crude creosote, in the proportions of nine parts of the former to one part of the latter and in some cases crude coal tar was used in conjunction with this mixture. These pavements dried out rapidly owing to the volatilization of the light oils in the crude coal tar and creosote and were all resurfaced within seven years.

The Taylor pavements were all laid in 1877, coal tar being the cementing material. There is no record of the patent under which these pavements were constructed, but they all did fairly well and and there are at the present time, two that have not been resurfaced.

The failure of these so-called coal tar concrete pavements was so disastrous and general, and as they were known as coal tar pavements, it was assumed that this material was responsible for their failure, but careful review of the formulae cited above, proves this not to be the case. In all pavements of this class which lasted well, no materials excepting refined coal tar was used as the cementing agent, with, in some cases, the addition of a little asphalt. However, the pavements in existence to-day, of this class, were all laid with straight refined coal tar, without the addition of any other cementing material, even asphalt. Not alone is it to the injurious ingredients added in many cases that the failures are to be attributed, but to the improper preparation of the coal tar cement, which, in most cases, was refined until too hard, and the crude methods employed in the manufacture of the pavement. There are several of these old pavements in existence to-day, the three best of which have already been mentioned.

The use of coal tar pavements was practically abandoned in the year 1878, and only sheet asphalt pavements were laid until 1886. In this year, a return to the use of coal tar pavements was forced by a clause in the appropriation act of 1886 and 1887, which provided that, under this appropriation, no contract shall be made for making or repairing concrete or asphalt pavements at a higher price than \$2.00 per square yard, of a quality equal to the best laid in the District prior to July 1, 1886, and with the same depth of base. As the lowest bid received for sheet asphalt was \$2.25 per square yard, the bids for asphalt block and coal tar were accepted.



NO. 3.—NINETEENTH STREET—COAL TAR PAVEMENT LAID IN 1875—
AVERAGE ANNUAL COST PER SQ. YD. FOR REPAIRS, SINCE
LAID, ESTIMATED AT LESS THAN ONE-HALF CENT

In the years 1886, 1887 and 1888, there was laid, of the coal tar pavements, a total of 122,987 square yards. The specifications for these pavements called for a base of well rolled broken stone, over which was sprinkled a coating of No. 4½ coal tar paving cement; on this was laid a binder course of one and one-fourth inches broken

stone, coated with No. 4 coal tar cement, which was rolled into the base, and the wearing surface, one and one-half inches in thickness, was composed of clean, sharp sand 58 per cent. to 63 per cent.; broken stone dust, 23 per cent. to 28 per cent.; paving cement, 13 per cent. to 15 per cent.; hydraulic cement, 9 per cent.; slack lime, 15 per cent.; and flour of sulphur, 1 per cent. The paving cement was made by combining No. 4 coal tar cement with Trinidad asphalt in the proportion of 3 to 1.

Although these pavements were of such light construction they have done fairly well. The poorest one lasted six years and in 1902, there was still in existence, 35,947 square yards. The average annual cost of keeping these pavements in repair has been \$0.029 per square yard. Even at this late date, on which these pavements were laid, the manufacture of coal tar cement was so crude that no two shipments could be obtained alike.

Mr. Richardson, in his report to the Engineer Commissioner in 1887, says, "By comparison of a large number of No. 4 tars, now in my office, which have been delivered to the contractors during the past summer, varying in consistency from density such that at 70° F. they could with difficulty be impressed with the finger, to a degree of liquidity which would make the tar extremely sticky and permit it to flow quite readily at that temperature." Not only did the coal tar cements, that were on the market at this time, vary in the degree of consistency, but many of them were what is known as cut back tars. These cut back tar cements were made by taking a hard pitch from which the anthracene had been distilled, as it commanded a high price in the manufacture of coal tar colors, and softened it back to a desirable consistency by the addition of dead oil or other light worthless oils. These cements were lacking in cementing value and hardened very rapidly owing to the volatilization of the light oils. Even the best quality coal tar cement, as prepared by the old fashioned method of distilling tar, can not be compared with those manufacturer under modern methods and experienced supervision.

It is seen, from the records and the examination of these old pavements, that as little judgment was exercised in the selection of the mineral ingredients as was used in the selection of the cement. There was no selection of materials that would contain the smallest amount of voids and in nearly all cases gravel was used mixed with round grained sand. In fact, nothing was done to select a mineral ingredient that would add rigidity to the pavement.

So much for the material that was used in these pavements.

METHODS OF MIXING INGREDIENTS

In looking into the methods in vogue for mixing the ingredients of these coal tar pavements and for placing the same in the streets we find them of most crude and primitive style. In the early seventies, the stone and gravel, in some cases, were mixed up cold with crude tar, on a mixing board on the street, like so much hydraulic cement. To facilitate this, the coal tar was often combined with dead oil, so as to make it sufficiently liquid. In cases where the materials

were mixed hot, the stone, gravel and sand were heated on large pans on the site of the work, and the tar mixed in open kettles; the two were then combined by the means of shovels and hoes.

The first real improvement in the method of heating and mixing the ingredients of the pavement was the introduction of portable heating drums and portable worm mixer; the process of heating and mixing being performed on the street. It was not until the year 1877, that materials were mixed at a paving yard and hauled to the street in wagons. It can readily be seen that with the portable heating drums it was impossible to regulate to a nicety the temperature of the mineral ingredients, and even though the materials had been selected with care and proper judgment it would have been impossible with such appliances to lay uniform pavements. It would be inferred from the crude selection and mixing of the ingredients that the placing on the street could not have been done with any degree of good judgment, and, in many cases, it was found that the foundation for these old pavements were totally inadequate.

The facts learned from this past experience in pavements is, that when they were laid with a very soft straight run coal tar cement they possessed long life. These successful pavements marked badly in the heat of the summer, which objection was less pronounced in those where the mineral matter was graded and contained a considerable proportion of about one-half inch gravel.

This is what naturally would be expected on examining into the theory of pavements and especially those constructed with coal tar. For we now know it is desirable to use as soft a coal tar cement as is possible. First. To guard against the possibility of it becoming too brittle in cold weather. Second. That as the mineral aggregate and coal tar bituminous cement must be mixed hot, the softer the cement the lower the temperature necessary, thus lessening the danger of overheating the cement which overhardens it by the volatilization of the light oils during this process. Third. The softer a cement the longer it will retain its elasticity and life.

To construct a pavement so that it can have the softest possible cement, a proper selection of the mineral aggregate must be made. If a certain quantity of coarse stone and a certain quantity of varying sized stone down to an impalpable powder be mixed in exact proportion, a stability is accomplished in the mineral particles themselves which permits the use of a cement far softer than could possibly be used successfully with an improperly graded material or with sand or gravel.

In fact, the long life of these old pavements can only be looked upon as a lucky accident, and for this reason it is a remarkable illustration of what coal tar bitumen can do by chance, even under unfavorable conditions.

The many failures of the past indicate how they may be avoided in the future, and the valuable lessons learned from these failures, together with the scientific methods employed in the construction of the Warren coal tar pavements, insures uniform success for the future for what has hitherto been obtained by chance.

GLENOE HAS A SUCCESSFUL SEWAGE PLANT

In endeavoring to fix upon the best form of sewage disposal plant for Highland Park, Ill., the committee in charge of the project paid a visit to Glencoe, a neighboring town, to inspect the sewage plant there.

This Glencoe plant is the first complete installation of the kind put in in the United States by the Cameron Company and is built to take care of 25,000 gallons of sewage per day. The septic tank is on the side of the bluff near the top and is fifty-six feet long, ten feet wide and seven feet deep. It is built of cement and is entirely covered with a concrete arch.

There are at the bottom of the bluff, also constructed of cement, four high level filters, each eighteen by fourteen feet, and four low level filters of the same dimensions. The eight filters are all filled to a depth of four feet with cinders. The sewage first passes through the septic tank, and is thence emptied on the high level filters, each filter being given a dose alternately, and then allowed a period of rest. From the high level filters the sewage is automatically and al-

ternately emptied upon each of the low level filters, and from these latter-beds, the effluent is discharged into Lake Michigan.

The entire operation is automatic, and the work it was doing, according to the committee, was from all appearances satisfactory. Some trouble was had, however, during the periods of local rain storms, from the excessive amount of storm water that gained entrance to the sewerage pipes. The flow from the sewer at times was at the rate of 400,000 gallons per day, and, of course, such a flow could not be disposed of by a plant calculated for only 25,000 gallons per day. During such periods the excessive flow is carried away from the tank and beds by a by-pass. There was also some trouble from water coming down the bank and washing out or filling up with clay parts of the filter beds; and from the sticking and failure of the automatic controlling devices to act. There is nothing unsightly in the appearance of the plant, and, in the opinion of the committee, "if it requires as little looking after as those in charge represented, it should be declared a success."

THE DETROIT GOOD ROADS CONFERENCE

Favors the Brownlow Bill and the Employment of Convict Labor—Next Annual Meeting to Be Held at Albany, N. Y., February, 1904

By the Secretary

NEVER before in the history of the good roads movement, have there gathered together, from all parts of the United States, so earnest a body of men as met at Detroit on February 13th and 14th, in response to an invitation sent out by the American Road Makers. Nearly one hundred and fifty delegates were registered and more than a score of states were represented, besides the Province of Ontario. When it is understood that all delegates from Oregon, Texas, Mississippi, Missouri, Iowa and elsewhere paid their own expenses to attend this Conference, it is the more remarkable.

The first session was called to order at ten o'clock by the president, Ex-State Senator Earle, of Michigan, who delivered his first annual message to the Road Makers and then announced the various committees. The delegates were welcomed to the city by Mayor Maybury, to which response was made by State Engineer Bond of Albany, N. Y. Immediately following, the convention settled down to work, discussing the needs of the various localities represented at this Conference and the most feasible way of supplying them. At the same time various memorials and resolutions were referred to proper committees. The roll call of the states was continued through the greater part of the afternoon, that session closing with an address from Martin Dodge, Director of the office of Road Inquiries, of the Department of Agriculture, in which he strongly advocated governmental assistance not only for those states which are already granting state aid but to those which had made no movement toward improving their highways, holding that the great arteries of commerce overland were as fairly entitled to government assistance as the water ways which were under the fostering care of the Nation.

The principal feature of the evening was an address upon the subject of "The Highways of the World," illustrated by stereopticon views, by Mr. M. O. Eldridge, Acting Director of Public Road Inquiries, of Washington, D. C. The first annual banquet of the American Road Makers was held at the close of this address. President Earle acted as toastmaster and Governor Bliss of Michigan, James H. McDonald, State Highway Commissioner of Connecticut; Edward A. Bond, State Engineer and Surveyor, of Albany, N. Y.; Arthur H. Battey, Editor, *Tri-Weekly Tribune*, New York City, and others, responded to toasts. About one hundred persons were present.

The morning and afternoon sessions of February 14th were spent in receiving the reports of the various committees. The Brownlow Bill, now before Congress, was indorsed, it being generally conceded that government support was essential to the proper development of the good roads movement in the United States.

The report on convict labor was the one which excited the most discussion. The report was as follows:

"The committee appointed to report to this convention as to the employment of prisoners under sentence in the improvement of the public highways and in the preparation of material to be used for the same beg leave to submit the following:

"That laws should be enacted in the various States and lawmaking communities providing for the development and improvement of public highways and in the production of material for the same by the employment of prisoners under sentence, and that the law should not only apply to convicts confined in the States prisons and penitentiaries, but also to convicts confined in the various county jails.

"That the various States should provide quarries, clay or gravel pits, when practicable, and proper machinery for working the same by convicts, so that road material can be provided and furnished to

the various communities in the various States on request free on board cars.

"That the various wardens of prisons and penitentiaries and sheriffs of counties be directed by law to employ such convicts as above indicated.

"We believe that the plans submitted by us are humane and proper for the employment of prisoners in our penal institutions, that thereby the State and people receive the benefit of better highways and the prisoners are greatly improved morally, mentally and physically, and now and then it may be that a good citizen can be made and saved to the community, and the objection so well known by organized labor that prison labor should not be so employed as to come into competition with free and skilled labor is happily avoided."

Mr. James H. McDonald, State Highway Commissioner of Connecticut, spoke in opposition to this report, saying that his State held that it was unadvisable to employ any convicts on the roads or highway construction of the State until every free citizen had refused to do highway duty. The representatives from eleven states took part in the discussion which followed and it was a token of appreciation of Mr. McDonald's earnestness of purpose that, when the final vote was taken and his was the only one recorded in the negative, he was greeted with a round of applause.

Other questions discussed were state aid, and a resolution introduced by a representative from Missouri calling for the provision of funds for highway construction and maintenance by the issuance of county bonds, indorsed by the state, and to be received by the United States Treasurer, as security for circulating medium to be known as good roads currency and having a low rate of interest. The discussion of this measure occupied considerable time of the afternoon session, but was finally settled by a resolution offered by Mr. Arthur H. Battey, of New York, providing that the question of the advisability of issuing such bonds and their acceptance by the United States Treasurer as security for a circulating medium, be presented to Congress for consideration. This resolution was unanimously adopted, and a committee representing Michigan, Pennsylvania and Missouri

was appointed to present the matter to Congress. Immediately following the close of the afternoon session the executive meeting of the American Road Makers was held.

Four amendments to the constitution had been submitted to the members of the organization more than ten days prior to the date of the annual meeting, all but one of which was laid on the table. This amendment adds a section to Article I, to be known as Section 3, to read as follows: "The granting of charters to state or district road makers."

This amendment was made necessary by the request from several states asking permission to organize state auxiliary associations of the American Road Makers, inasmuch as the national membership is limited, the suggestions being offered that the national American Road Makers grant charters to states permitting them to organize state associations with unlimited membership, they to co-operate with the national organization in furthering the good roads cause throughout the country. An effort will be made to secure the formation of auxiliary organizations in all the states of the Union during the coming year.

Under the constitution, as provided in Section 3 of Article III, which reads as follows, "Those who may have distinguished them-

(Concluded on page 127)



HORATIO S. EARLE,
President American Road Makers



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City Pavements

THE present number of the MUNICIPAL JOURNAL AND ENGINEER is largely devoted to the subject of pavements in city streets, and contains several papers of extraordinary interest which have been prepared by acknowledged experts. Most of the best known varieties of modern pavement are discussed in a thoroughly practical and instructive manner and will amply repay attentive study.

This series of papers was begun in the preceding February number, page 51, by the reprint of the valuable paper on "The Maintenance of Asphalt Streets," by James N. Hazlehurst, C. E., read before the American Society of Civil Engineers last September and published in Vol. XLIX of the Transactions of the Society. It elicited much comment from several of the recognized authorities on the subject, and its discussion by Samuel Whinery, M. Am. Soc. C. E., given in full in the present number, is an exceedingly welcome contribution to the literature of the subject. A continuation of the discussion by other experts will be found in the April number of the JOURNAL.

A formidable rival to the use of granite blocks for paving purposes is the Medina stone block pavement, which has become very popular in the cities of central and western New York, Ohio, Indiana, Michigan and the Province of Ontario. This sandstone is very hard and tough, as the cementing material is mainly silica and iron oxide. It is, however, readily split into rectangular blocks whose tops are easily dressed to an even surface, and possesses the desirable property of not becoming slippery by wear. When selected with care at the quarries, these blocks are found to be fully as durable as granite under heavy traffic, besides being much less noisy. The construction and merits of this pavement are amply explained in the paper by Edwin A. Fisher, M. Am. Soc. C. E., the accomplished City Engineer of Rochester, N. Y., and past president of the American Society of Municipal Improvements.

The most recent practice in wooden pavements is ably set forth in the excellent paper of Frederic A. Kummer, Mem. Am. Soc. C. E., of New York. Despite the various disadvantages which were found years ago inherent to wood as a paving material, such pavements have, nevertheless, gained marked favor in the principal cities of Great Britain and Continental Europe, and municipal engineers have striven persistently to devise new methods of preservative treatment and construction whereby better results shall be attained. The most satisfactory of these processes are fully described in Mr. Kummer's

paper, and if they stand the crucial test of time, a vigorous revival of the former popularity of wooden pavements in our American cities may be expected.

Brick pavements are discussed incidentally to a review of Prof. Ira O. Baker's new book on "Roads and Pavements." Owing to their cheapness and their serviceability under moderate traffic, these pavements have become very popular for use on the main streets of our smaller cities and the residential streets of the larger ones. Since their introduction over thirty years ago in Charleston, W. Va., they have steadily gained in favor, and from the constant efforts that are being made in many directions towards betterment, there is every prospect that their popularity will continue to increase.

The Macadam pavement is the topic chosen by F. F. Rogers, C. E., of Port Huron, Mich., and his paper is replete with interesting facts and details. Notwithstanding the long experience with macadamized roads, new points of view and construction are always very acceptable, as the advantages of this kind of pavement have been recognized since the days when all roads led to Rome. For suburban and rural traffic they have hitherto had no economic rival, and with the advent of the speedy automobile, their continued serviceability will soon become a matter of interesting investigation.

Bitulithic, or Bituminous Macadam, pavements are treated by Walter B. Warren, Esq., whose long and intimate acquaintance with asphalt and similar substances for paving purposes renders him specially well qualified to discuss the subject. When properly made, this pavement combines the good qualities of macadam with the best qualities of sheet asphalt. A pavement of this character was laid in 1873, in a populous residential street in Rochester, N. Y., and remained in excellent condition without requiring any repairs for eleven or twelve years, when it was spoiled by laying street railway tracks therein. This record has not been exceeded by any asphalt pavement which has come to the writer's notice, and hence he is convinced that, with proper attention to materials and construction, a bright future is in store for Bituminous Macadam.

Various other kinds of pavement might likewise be mentioned in this connection, but the space therefor is not available in this issue of the JOURNAL. In future numbers, however, they will receive due attention from specialists, as it is the plan to give in the two volumes of the current year a full account of all kinds of city pavements which have been demonstrated to be worthy of public recognition.

In the consideration of pavements, the character of the soil and means of drainage are important elements. Rendering the roadway surface alone water-proof is not enough in cold climates, as it is found that moisture must also be kept from gaining access to the earthen foundation from the sides of the street. In most cases where expensive pavements are laid, sewers have previously been constructed which serve to protect the foundation from a rise of the ground water in wet seasons; but frequently no protection against percolation from the sides is found, and in retentive soils more or less trouble arises therefrom during the winter.

Moisture also causes an appreciable swelling of all concrete foundations, as well as a reduction of their strength, while drying the concrete produces tendencies in the opposite directions. In clayey soils it is therefore expedient to provide adequate drainage facilities, and the means by which this is effected become matters of both professional and public interest. In sewered streets it is commonly done by laying 3 or 4 inch drain tiles in a narrow trench filled with gravel or coarse sand under each line of curbing.

The means of combatting the effects of changes in length of the paving material in consequence of changes of temperature are also of interest, and have led to many different experiments. Observations of these effects should be made very closely, and should be carefully distinguished from those due to moisture or dryness. In this way alone can a reliable practice be established. Similarly, sharp observations as to the behavior of various materials for filling joints are needed, as well as for the determination of the best thickness of such joints.

Much might also be said about the composition or preparation of the various kinds of asphalts or bituminous materials used in different classes of pavement. The substance called "paving pitch" is often variable in quality, although it is said to be prepared as carefully as chemists manufacture standard drugs. Quick methods of testing

these compounds are likewise needed, together with a good knowledge of the physical characteristics of their several principal components. Such knowledge is doubtless available, but unfortunately there is a strong tendency to keep it as a business secret. Were it more widely diffused, the prices of certain good pavements would probably fall somewhat, but the business would assuredly increase by reason of establishing greater confidence in the material.

The construction of pavements in which street railway tracks are laid is a favorite theme for discussion by municipal engineers, and judging from some of the most carefully prepared papers on the subject, an entirely satisfactory solution of the problem has not yet been reached. Here again we find the need of close observation from the points of view of both the railway manager and the street superintendent; and it is hoped that in the near future some standard of practice will be fixed which will result in the attainment of greater durability for the pavements of the principal thoroughfares of our American cities.

E. KUICHLING.

The Usefulness of a Statistics Department

THE usefulness of a Statistics Department in the city of Boston is no longer a debatable question for that has been thoroughly demonstrated by several years' experience. There have been some complaints, it is true, about the slowness with which many of the statistics have been published, and also as to the nature, variety and manner of handling some of the subjects, some of which have not been without justification. On the whole, however, the results have been satisfactory. Several of the cases of complaint have arisen from hindrances with which the Department itself had nothing to do, such as belated reports from the forty-three different departments of the city, lack of funds for clerical and other assistance.

Two distinct lines of inquiry have been followed by the Department: one, having to do with financial statistics, or the receipt and expenditure of public money; the other, having to do with social or economical statistics, relating to population, elections, education, commerce and other conditions. In both branches a high standard of accuracy has been established and maintained. The trustees of the Department now realize the necessity of extending the work into other fields.

"This Department ought to obtain, and publish tables," they say, "showing the comparative cost and results of the same work in this and other cities. Such information would be not only of great value but of great interest to the public. To do it thoroughly and well, the statistics relating to Boston must first be got and put into shape. We must thoroughly understand our own business before we attempt to compare it with that of other cities. We must next establish a proper basis of comparison. Varying conditions of population, methods of work and bookkeeping, geographical situation and service rendered to the public must be taken into consideration. And, finally, we must obtain the same information as to cost and results in other cities that we have as to cost and results in Boston, making sure that the figures are compiled on the same basis. The published reports of other cities cannot be accepted as they stand. Even should we be content with knowing the per capita cost of work in other cities, leaving other considerations aside, the published estimates of population are so unreliable as to make such comparisons far from accurate—the percentage of error in some cases being 23 per cent."

Boston has had enough experience to make it thoroughly realize the difficulty of the work before it and before assuming additional responsibilities, the trustees feel that the Department must have three things, as follows:

"First, A corps of trained investigators large enough to get at the heart of the matter, and produce results within a reasonable time.

"Second, An annual appropriation of fifty thousand dollars to provide for such a corps.

"Third, An ordinance requiring every head of a department to furnish from his records or accounts, such information, in such form and at such times as the Statistics Department, with the approval of the Mayor, may require."

Boston was the first city to take up this work. New York followed by creating a similar department and failed, as the department never

issued so much as a circular, and was recently abolished. Chicago created a similar department about two years ago, patterned after that of Boston, and its affairs have been successfully administered.

It is to be hoped that the request of the trustees of this important department will be granted, for the information gathered in Boston, under such auspices would be most valuable to other municipalities both at home and abroad.

Needed Police Reforms

AMERICAN police departments, as now run, are autocratic and not democratic institutions. Police commissioners, chiefs of police and patrolmen are clothed with too much power. Under present conditions the rank and file seldom think of themselves as the servants of the people, and all sorts of wretched abuses exist. It is not an infrequent occurrence, especially in the large cities, for women to be insulted by policemen and then, when the insult is resented, to be arrested and run in as "a woman of the street." Most policemen have become so arrogant and domineering that the average citizen lacks the temerity to call the attention of an officer to an apparent neglect of duty. If any citizen of New York, under a Tammany administration, were to presume to such an extent he would be haled up for disorderly conduct, and he might be thankful if he escaped without a clubbing. The frequency with which poor people are imposed upon by policemen is growing intolerable. The fact that these conditions exist is notorious, as the recent exposures in New York, Philadelphia, Minneapolis and elsewhere, attest.

That this attitude is not maintained by the police officials in well governed cities is not generally known, but we only have to look over the borderline, into Canada, to find police departments which are models in this particular. Our contemporary, the *Hamilton Herald*, recently gave the following incident, which illustrates the point:

"In speaking to some ladies, to warn them away from a danger point near a fire, a couple of policemen did so somewhat rudely, for which a gentleman stepped up and rebuked them, whereupon they apologized and promised not to offend again!"

If that had occurred in New York City, the man who presumed to administer such a rebuke would have been immediately arrested and carried either to a police station in a patrol wagon, or to a hospital in an ambulance.

As a means to better present conditions we would suggest that the Mayors of the various cities take the matter into their own hands instead of waiting until the situation becomes so utterly intolerable that the citizens undertake the work themselves in such manner as was carried out by the Committee of Fifteen here in New York. Appoint a committee, made up of judicious, common sensed, non-Puritanical persons,—one-third of whom shall be broad-minded women,—to investigate and become familiar with actual conditions. Then let the Commission seek to work out remedies and recommend means of applying them. The investigation should include careful and thorough inquiry into the treatment of prisoners, particularly boys of eighteen or under, and those of any age or sex who may be arrested for the first time; the Commission should receive and sift complaints from those persons—men, women and children—who think they have any just grievance against the police force; not forgetting to examine the lock-ups and jails. Give the Commission all the assistance needed and put it up to the members to locate the evil and to devise ways and means for rooting it out. It is by no means an easy task, nor an impossible one.

What Districts Should Be Cleaned First?

THE first concern of a street cleaning department, in any city, should be to keep the tenement house and poorer sections of a town thoroughly cleansed. If any portion of a city is to be neglected, either in the collection of garbage or the cleansing of the streets, it should be where the rich live, for two reasons:

First, because the streets and avenues where wealthy people dwell, generally speaking, are broader and more open to the purifying influences of air and sunshine, less populous than the tenement house district, and, consequently, there is less danger to the occupants of these

houses. Second, because if these broad avenues and streets are neglected there is more chance that the residents will make themselves felt with an administration in procuring an appropriation large enough to provide for the thorough cleansing of the whole city. City officials, as a rule, have a way of turning a more attentive ear to the complaints of the rich than to those of the poor.

Commissioner Woodbury, of the New York Street Cleaning Department, has set his fellow officials an example in this regard which is worthy of universal imitation. He does keep the poorer sections clean, even at the expense of the more aristocratic districts. As a direct result of this policy, there has been a corresponding decrease in the death rate of New York during the past twelve months. If other cities were to follow his example there would be, no doubt, as gratifying results.

His method could be used with telling effect, for instance, in the French and other quarters in New Orleans. In fact, it would be difficult to find a section of that Southern city where better cleansing methods would not improve the public health. Our contemporary, the New Orleans *Picayune*, in referring to the subject recently, had this to say:

"The street cleaning service appears to have reached the limit of inefficiency. In this connection the language of the President of the City Board of Health is most appropriate, thus: 'It is better that a street should be unclean to the eye than that the dust should be swept into the nostrils of pedestrians and the dwellings of those who may be susceptible to diseases transmitted in this way. It is better that a gutter should remain choked with mud than that its contents should be spread over an extended area of street, and remain for several hours to poison the atmosphere. The proper sanitation of a city is not alone the removal of dirt, but is the removal of dirt with the minimum of injury or offense.'

"The only possible palliation of the situation is the fact that the money devoted to the garbage and street cleaning service is plainly inadequate, but it is certain that with as insufficient means the work has been vastly better done. The burden of the blame has now come back upon the Mayor and Council. Something must be done to secure some relief. The streets must be cleaned up for the Mardi Gras season, and no time is to be lost."

But New Orleans is not the only city where poor housekeeping is practiced. In comparison with its possessions and geographical situation Chicago is incomparably worse. The latter has abundant means while the former is still handicapped by the useless debts placed upon the city in the days of the "carpet baggers." With New Orleans it seems to be a case of stern necessity, while with Chicago, of choice. Besides these cities there are many others which need to give closer attention to cleansing methods, particularly of the tenement house sections.

EDITORIAL COMMENT

Hoboken Puts Wires Underground

THE city of Hoboken is entitled to a place on the roll of honor for passing an ordinance requiring all overhead wires to be put underground. There are a number of larger cities in the country which might well imitate the example of Hoboken.

A Bad Paving Proposition

THERE is a bill before the Missouri Legislature which proposes to change the present Board of Public Works of St. Joseph. It should be beaten at all hazards because its objectionable features overshadow its good points. The most objectionable feature is that it provides that no street which has ever been paved can be paved with any other material than that first used. Such a provision is not warranted by any excuse whatsoever. It is too absurd a proposition to need refutation.

Water Works Convention June 23-26

We are informed by the secretary, Mr. J. M. Diven, of the American Water Works Association, that the twenty-third annual convention of the Association will be held at Detroit, Mich., June 23 to 26 inclusive. Headquarters will be at the Hotel Cadillac, where members will be exceptionally well accommodated and manufacturers will be afforded ample space for their exhibits. Those wishing further particulars should communicate with the Secretary at Elmira, N. Y.

A Foolish Resolution Against Meters

It does not seem possible that any sane body of business men would pass so foolish a resolution as the following:

"Resolved, by the Business Men's Club of Memphis, That this organization regards the use of meters by the water company as detrimental to public health, and we are therefore opposed to any extension of the present franchise enjoyed by the Artesian Water Company which would carry with it the use of meters. Be it further

"Resolved, That we are in favor of the adoption of such measures as may be necessary and possible to abolish the use of such meters as are now in use, to the extent of municipal ownership, if necessary."

If the committee which framed this resolution and the Business Men's Club which passed it, will give the question of the use of meters serious and close attention they may be convinced of the error of their ways. The water meter has been recognized for a number of years as a sanitary agent, and as a means of preventing useless waste of water it is without an equal. The cities of Rochester, Detroit, St. Paul, Washington, Boston, and many others have demonstrated the usefulness of the water meter both as a sanitary and economical agent. It is to be hoped that the city officials of Memphis, to whom these resolutions will be submitted, will have the good sense to table them.

Municipal Milk Stations Save Many Lives

OUR contemporary, *The Free Press*, of Detroit, facetiously puts the question to Mayor Maybury, "Why Not Establish a Municipal Milk Wagon?"

This suggestion is offered in sarcasm because the Mayor saw fit, some time ago, when the city was in the throes of a coal famine, to establish, temporarily, a municipal coal yard, which, under the circumstances, we think was a very creditable thing to do. We maintain that, especially during the summer months, it would be a very sensible thing for the city of Detroit to establish municipal milk stations, following the example of New York, Rochester, and other American cities where such has been the practice for a number of years with gratifying results. For instance, Rochester, in a period of four years, reduced the death rate among children of five years of age and under, one-third, saving thereby over one thousand lives by the establishment of well conducted municipal milk stations and the careful inspection of the milk peddled in the city. Similar gratifying results have been obtained in Greater New York. And if our Detroit contemporary would take the trouble to look up conditions abroad he would see where Mayor Maybury would be justified in establishing milk stations. Civic authorities are all too careless of the health of the public in their lax methods of food and milk inspection, and if there were some means of compelling them to faithfully perform their duties it would greatly reduce the death rate of every large municipality.

Ventilation of Sewers Essential

THE proper ventilation of sanitary sewers is given too little consideration by American municipalities. It is a question which receives much attention and intelligent action on the part of city officials of the Old World because they have long since recognized the necessity for it. The Health Officer of McKeesport, Pa., recently reported that two small children who had been peering into an open sewer got their heads caught between the bars for a short while, and within a few days were taken ill, one with scarlet fever and the other with smallpox. He asserts that this furnishes substantial proof of the existence of disease germs in sewer gas, and believes it to be a

sufficient reason why the authorities of McKeesport should authorize the installation of a thorough method of ventilating the city's sewer system. The need of efficient systems of sewer ventilation is so thoroughly recognized by those who have given the matter any thought or study, that it is generally admitted without discussion. We recognize the fact that our municipalities are growing at such a rapid rate and various public improvements requiring an expenditure of large sums of money, have been thrust upon them so uncertainly by the necessity of local conditions, that it is impossible for the authorities to do everything at once, and so, there is some excuse for those who have not yet arrived at the stage of perfection. "Rome was not built in a day," neither can the necessary improvements be made in any great municipality in one short decade. Nevertheless, we believe it should be the policy of civic authorities to push forward those improvements which are most essential to the preservation of public health, and sewer ventilation is one of those which should receive immediate attention.

Politics Retard Necessary Improvements

PENNSYLVANIA municipalities have more than their share of trouble in securing public improvements. This holds true even when the public health is endangered, for the powers that oppose and retard adequate and speedy installation of such public necessities, as filtration plants, care not a fig for the public health—it is the rake-off, the blood money they are after. This has been notoriously true of Philadelphia and Pittsburgh. The lamentable situation is due to the dominance of one party and the control of that party by one unprincipled boss. Our contemporary, the Pittsburgh *Dispatch*, sends up this wail:

"It is plain that there is little hope for relief from the politicians. But the people should make one thing plain. For every death from typhoid, for every week of sickness spent by sufferers, for the cost and loss of time to thousands of people, the stupidity, fatuity and greed of the politicians of both machines are responsible. If there had been business capacity in charge of Pittsburgh's affairs we could and would have had filtered water in 1897. That there is little prospect of it in 1903 is the severest commentary on government by political machines that is possible."

We deeply sympathize with these municipalities in their sore affliction. The only advice we can give as to how they may rid themselves of their "old man of the mountain" is to take a winning opposition gait and stick to it. The only other alternatives are to emigrate or get a lot of decent Democrats to move in.

LETTERS TO THE EDITOR

About Federation of Municipal Societies

What Is Thought by Some of the Leaders of the Proposition to Form a Federation of the Various Municipal Societies

"Concentration Much More Efficacious"

NATIONAL ARTS CLUB, N. Y., Feb. 16, 1903.

Editor, MUNICIPAL JOURNAL AND ENGINEER:

In regard to the proposed federation of the various municipal organizations, personally I am strongly in favor of all federation which tends to reduce the possibilities of conflict between the various organizations in their work and make the united efforts, by concentration, much more efficacious. Therefore, without being familiar with all the details of the movement to which you refer, I should be favorably inclined to its fulfillment. I should consider that it was possible and practicable, but its success would be dependent upon the method of the federation and the way in which the work of the constituent societies was assisted, instead of being interfered with, by central organization.

CHARLES R. LAMB.

"Deserves Public Support"

15 MACDOUGAL ALLEY, N. Y., Feb. 18, 1903.

Editor, MUNICIPAL JOURNAL AND ENGINEER:

I am acquainted with the work of Mr. Clinton Rogers Woodruff in behalf of a federation of the societies interested in the various phases of municipal affairs, and am one of his committee to attain that result.

Concentration and co-operation with entire freedom of separate action is the result aimed at, and I think will combine the advantages of specific kinds of effort, with the diminution of loss resulting from unrelated work. Encouragement, mutual assistance, and better distribution of information should broaden the work of each separate organization.

I think the movement deserves public support.

H. K. BUSH-BROWN.

Questions "Substantial Benefit Derived"

CITY HALL, NEW YORK, Feb. 20, 1903.

Editor, MUNICIPAL JOURNAL AND ENGINEER:

REPLYING to Mr. Woodruff's suggestion, made in the February issue, as to a more or less close federation of the several organizations whose work relates to the various phases of municipal affairs.

A number of these associations have been organized within the last half a dozen years. Some of them are devoted to discussions of the theories of municipal government, while others, technical or semi-technical, are devoted to the conduct of municipal work; others again have specialized their work so as to devote their attention largely to parks or alleviating the conditions of the poor in densely populated sections.

I personally doubt whether any substantial benefit would be derived from a federation of these different societies. The lines along which they have been working are quite different, and I do not think that the mere size of their conventions would in any way enlarge their usefulness. Fifty or sixty men, with an earnest purpose and in hearty sympathy with each other, will probably accomplish more at a meeting than would a large convention, the majority of the members of which have only a superficial interest in many of the subjects discussed.

My candid opinion, therefore, is that these societies will probably accomplish more if each of them work along in its own sphere, although, as I have already suggested to the American Society of Municipal Improvements, some benefit might be derived if, for one year, each of the Societies would arrange to have its convention in the same city and at the same time with the others. It would soon be demonstrated, in that event, whether or not there existed a real basis for federation or co-operation. Further than this I should be reluctant to go at the present time.

NELSON P. LEWIS, *Chief Engineer, Board of Estimate and Apportionment.*

Too Many Organizations

TORONTO, Feb. 21, 1903.

Editor, MUNICIPAL JOURNAL AND ENGINEER:

With reference to Mr. Clinton R. Woodruff's suggestion, in your last number, as to a closer federation of a number of municipal organizations which are now in existence, there is no doubt that there are too many associations attempting to cover the same ground. At the last meeting of the American Society of Municipal Improvements the question of affiliation was discussed but the majority of the members were unfavorable to federation at present.

I agree with your editorial, in the January number, that all cities and towns should be represented by the heads of the important departments. Unfortunately, a number of the mayors and members of the council cannot see the necessity and advantage of being represented at the annual meeting of these associations and look upon them very often as junketing trips and members of the council are occasionally sent unaccompanied by the heads of the departments, and take no interest in the discussions.

If it is decided to have one general association, it would be necessary to have it sub-divided into departments and states. Unless this were done, the country being of such a vast extent, it would be ex-

tremely difficult for all cities to be represented at the annual meetings.

I am of the opinion that the time has arrived when a society should be formed, composed entirely of engineers engaged in municipal work, similar to the Association of Municipal and County Engineers of England. It has always appeared to me as one of the weakest points in municipal government in the United States that the term of office of many of the officials is far too short. This, of course, is largely owing to the introduction of politics, which I consider a curse in cities, especially where it affects such an office as that of the city engineer. A society, such as I have suggested, should be a decided benefit to the profession in bettering this unfortunate condition of affairs. It is surprising to me that under the existing conditions, such good results are achieved, although there must be in some places a very large waste of public money caused by the introduction of politics into municipal affairs.

C. H. RUST,

President Am. Soc. Mun. Improvements.

An Additional Suggestion

HARTFORD, Conn., Feb. 20, 1903

Editor, MUNICIPAL JOURNAL AND ENGINEER:

I READ with satisfaction your article in the January number regarding some scheme of federation for the different societies of national ambition, which have the common purpose of municipal improvement, and also have read Mr. Woodruff's letter on the same subject in the February issue, and they have stirred within me the desire to add my mite towards the consummation of what I believe to be most desirable.

Just what form it should take, and how it is to be brought about, is something which puzzles me not a little, for the result desired is to strengthen, to widen, to deepen and to elevate the different associations which may unite to form its central body, and there may be, I fear, danger in crystallizing the movement into one central body, that the life and energy which those societies now have may be stunted if not destroyed. It is almost certain that this life and energy cannot all, or even the greater part of it, be transferred to the central body, if the crystallization takes place on ideal lines.

Nature teaches us, in her making of the world, and history tells us, in the development of a nation, that no movement ever has a real, or a permanent success, unless it grows out of, or is evolved from, that which was vital to what preceded it. Human nature, as well as our good old mother "Dame Nature," never creates anything by having a pattern made perfect and then make everything under it conformed to that pattern; she builds up from the beginnings of things and not down, from an ideal. "She builds the future out of the past. Her building is never perfect, but always striving for perfection; never realizing the ideal, but always struggling with the real. So this movement should not be crystallized perfect unto itself, beautiful to dream over, but as useless as a diamond. The federation should not be paternal in its work, trying to create, or foster, or direct, the societies which may compose it. It should not even suppose it represents their ideals, or stands for them in any way, or that it wields the combined influence of them all. It should be more the nature of a clearing house, where all manner of municipal experiences may be deposited, and from which may be drawn out such information as may be needed. It should exist simply as a convenience for the societies, and not in any way to supersede them.

Will you allow me to make a suggestion, as to how that central body might be formed? If so, I would like to suggest that the societies in this federation elect from their membership a congress, for the deliberation and reporting on questions which may be brought before them. That the different divisions of municipal government—their different functions and features—be represented in this central body, by a committee made up of one delegate elected from each of the different societies, the total of all these committees to form the congress, and so, in whatever way the work of a city might be divided, each society would be represented on that division, the chairman to be the delegate from that society which gives special emphasis to the subject of his committee. To begin with, these divisions might be few; it would be easy to add to them as circumstances make necessary. If, to begin with, there should be included

in this federation the eight societies at present deeply interested in municipal improvement, that is, "National Municipal League," "American Society of Municipal Improvements," "League of American Municipalities," "American Park and Outdoor Art Association," "American League of Civic Improvement," and also the three national societies of "Architects," "Engineers," and "Landscape Architects." Then each of these committees would consist of eight members, and if the municipal work were divided into fifteen parts, could easily make more than that number. Then the congress would consist of one hundred and twenty members, and its work and investigations, its reports and suggestions, would be of inestimable value to the municipal life of this country.

This letter has become altogether too long. I have tried to sketch what was in my mind and will not burden you with details.

G. A. PARKER, *Superintendent of Keney Park.*

37 WEST 34TH STREET, N. Y., Feb. 19, 1903.

Editor, MUNICIPAL JOURNAL AND ENGINEER:

In a recent copy of the MUNICIPAL JOURNAL AND ENGINEER, I note a letter from Clinton Rogers Woodruff, of Philadelphia, in reference to a federation of the several organizations whose work relates to the varying phases of municipal affairs. Permit me to echo Mr. Woodruff's statements and to indorse most heartily this scheme.

The proposition is a simple one: A number of organizations, such as the American Park and Outdoor Art Association, the American League for Civic Improvement, the National Municipal League and the Architectural League of America, have, in the development of their work, found themselves covering lines which, in many cases, were identical. In order to avoid duplication of effort and unnecessary expenditure, a conference was called to consider the possibility of creating some form of federation or civic alliance that would be acceptable to its constituent members.

It contemplates, if possible, the establishment of a general headquarters as a common bureau of information; and the dissemination therefrom, from time to time, of information of interest to the constituent societies.

It is hoped that such a scheme would eventually secure the services of a permanent secretary who could guide the work of the various organizations without interfering therewith. He could supply them with invaluable information impossible for them to obtain without his assistance. He could take charge of the various conventions and see that they did not conflict either as to time or place. The constituent societies, could, if desired have their printed data compiled and edited by him, with little cost and a great saving of friction. This information and the various annual reports of the societies would constitute a complete record of the year's work to be issued in book form.

These are but a few of the many advantages which, in my humble opinion, would accrue from such a federation.

F. S. LAMB, *President,*

The Architectural League of America.

The question of federation as discussed by the above correspondents is one of vital importance to the numerous national municipal organizations, and one which the editor would be pleased to have more fully discussed by any of the readers of THE MUNICIPAL JOURNAL—[EDITOR.]

(Continued in April)

Asphaltic Deposits in Texas

At a distance of from ten to twelve and one-half miles from Palestine, Texas, there is a deposit of partially consolidated sandstone impregnated in many places with an oily or asphaltic residuum. The asphaltic sand outcrops in the creek's banks and all the wells that are dug in the neighborhood show evidences of it. Estimates place the deposit at forty feet in thickness, the asphaltic material impregnating more than one stratum. The asphalt is present in sixteen other counties of the State, and in three or four counties samples have been analyzed by the State Mineral Survey. One of the best deposits appears to be in the neighborhood of Palestine as mentioned above where the total bitumen in the rock averages at best 23.34 per cent., with no carbonate of lime, 0.43 per cent. of sulphur, and the rest silica.

(CONCLUDED FROM PAGE 121.)

selves by large gifts of money, or time, or talent, or, who are actively connected with the United States Office of Road Inquiries, or any department which may succeed it, having like or larger purpose in view, shall be eligible as Honorary Members and shall have all rights of Active Members, except voting and holding office," Mr. Fred J. Warren, of Boston, was unanimously elected an Honorary Member of the American Road Makers. Mr. Warren is the first one to be thus honored by this Association and he was deemed worthy because of his long years of study and research given to the question of street and road improvements.

The following officers were elected for the ensuing year: For president, ex-State Senator Horatio S. Earle, of Detroit; first vice-president, Edward A. Bond, State Engineer and Surveyor, of Albany, N. Y.; second vice-president, Mr. Charles Dwight Willard, Southern California Good Roads Association, Los Angeles, Cal.; third vice-president, Prof. J. A. Holmes, North Carolina Geographical Survey, Chapel Hill, N. C.; treasurer, Col. W. L. Dickinson, Connecticut Valley Highway Association, Springfield, Mass.; secretary, W. S. Crandall, New York.

The next annual meeting of the American Road Makers will be held at Albany, N. Y., in connection with the annual meeting of the New York State Supervisors, probably some time in February, 1904.

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American Occupation of Havana

SINCE the American occupation, the city of Havana, Cuba, when under military control the city was converted into an exceedingly healthy place by means of thorough cleaning of the sewers, streets, buildings, hospitals, etc., the effort made at that time has been gradually relaxed under native control. It was only by continual disinfection of the sewers and streets and by thorough inspection of all buildings every two months, and by the enforcement of perfect sanitary system of plumbing, that the condition of the city, as left by the military forces, was secured. The remodelling of the plumbing work in the old unsanitary buildings of the city has been gradually decreasing, the only efforts being made to place good plumbing in new buildings. As we predicted, the military rule of the city ended, the inspections of sanitary features about the houses are very perfunctory, and while the letter of the law is enforced, the spirit is entirely overlooked. In many cases at present when waste pipes are embedded in the walls no care is taken to see that the joints are caulked and lead filled, but the pipes are sealed up by the concrete or cement, and nothing is heard from them until the ground happens to settle about them so that the flooring or walls crack when the emanations from the pipe are plainly evident. In the matter of cesspools and drain water pits the regulations require that the cesspool must not be covered until passed upon by the inspector. This individual makes a hasty glance at it and hands in a report that all is correct. Instead then of having the cesspool sealed as required, a few boards or stones are laid across it, some loose dirt shovelled on and the top of a "hermetically sealed" cesspool located within the house, is obtained. While the cleaning of the streets has been carried on fairly well since American occupation, the house to house inspection has not been continued with the vigor that was displayed under military control. Great opposition is met with from landlords and the inspector makes but a perfunctory examination and reports favorably what has been found to be the reverse. The cost of carrying on the work under the Cuban government, as compared with that under the military, has been greater by over \$2,000 a month.

The Hon. Clark Howell, editor of the Atlanta (Ga.) *Constitution*, after a visit to Havana, is quoted as having said: "Havana to-day is the cleanest city in the world, I believe. I never saw anything like it. Miles and miles of streets just as clean as one's front yard. They have not had a case of yellow fever there in eighteen months. The people are showing their ability to govern themselves. The country is free from debt and has \$2,500,000 in the treasury. The Government has been established in the island only since last May, remember. Of course, the American occupation started the improvements."

Personalities

—Mr. H. C. Majan has been elected Mayor of Newton, Miss.

—Mr. T. D. Newbern has been elected mayor of Bolivar, Tenn.

—At the municipal election held in Pittsburg, Pa., Mr. W. B. Hays, Citizen-Democrat, was elected Recorder by a small majority.

—A decision of the Supreme Court of Massachusetts has placed Parkman S. Flanders in the mayor's chair in Haverhill. Mayor Flanders was the Socialistic candidate and trouble arose over the election count which was very close.

—Ex-Secretary and Treasurer T. W. Warringer writes that at the last meeting of the Iowa Engineering Society held at Ames, Ia., January 21 to 23, Mr. W. H. Jackson, of Des Moines, was elected secretary and treasurer. All communications should be forwarded to him.

—Despite the efforts of United Mine Workers, Mr. A. T. Connell was elected mayor of Scranton, Pa., over Mr. John J. Fahey, Democrat, and Rev. E. L. Watkins, the candidate of the United Mine Workers. Investigation showed that the Rev. Watkins received scarce half of the labor votes.

—Mr. John H. Watkins, City Attorney for the city of Memphis, Tenn., has resigned and his resignation was accepted by Mayor Williams with regret. Private business interests prevented Mr. Watkins from giving the best attention to both public and private business, so he was compelled to sever his relations with the city administration.

—A motion was recently introduced into the Council of Boston, Mass., calling for the expulsion of Councilman William H. Curley, who had pleaded guilty to the charge of obtaining money under false pretenses. The motion was lost, however, on a strict party vote, all the Democrats supporting Curley and all the Republicans voting to expell him.

—Mayor Caldwell, of Sioux City, Ia., recently vetoed a resolution to license gambling in the city. The aldermen had passed the resolution on the plea that, as gambling was to continue in the city, the city should receive revenue from it. Mayor Caldwell acknowledged that the city needs additional revenue, but was unwilling that it should come from such sources.

—Mayor Stafford, of North Adams, Mass., recently made the following appointments of officials: City Engineer, Mr. Frank B. Locke, to succeed Mr. J. H. Emigh; City Solicitor, Mr. C. P. Niles, to take the place of Judge C. T. Phelps; Commissioner of Public Works, Mr. J. L. Temple; Treasurer, Mr. J. W. Hardenbergh; Chief of Fire Department, Mr. W. W. Byars.

—Mr. Henry Walters, of Baltimore, Md., has presented the city with \$15,000 for use in establishing free public baths. This sum is to be used to double the capacity of one of the baths. The Public Bath Commission had asked for this sum from the Board of Estimates, but the condition of the city's finances prevented the Board from allowing it. Mr. Walters also offered to give \$25,000 for a third bathhouse.

—Mayor Manuel Egozcue, of San Juan, P. R., has been removed from office by Governor Hunt on charges of incompetency and criminal responsibility for frauds in the administration of the affairs of the city. Mayor Egozcue had been previously suspended after being arrested for destroying city records. Later reports state that the Mayor has been acquitted of the charge of destroying the records and of embezzlement.

—Because of a desire to locate a garbage crematory in the Borough of the Bronx, New York City, some of the residents expressed a desire to lynch Street Cleaning Commissioner Woodbury in revenge for trying to place the plant in their midst. So much objection was made to the proposed site for the building that it is likely a different locality will be chosen and the Commissioner be allowed to pursue the good work he has been doing for some time to come.

—At the annual meeting of the Engineers' Society of Western New York held at Buffalo, the following officers were elected for the ensuing year: President, Mr. Samuel J. Fields; vice-president, Mr. George H. Norton; director, Mr. Soren M. Kielland; secretary, Mr. Lee M. Eighmy; librarian, Mr. William A. Haven; treasurer, Mr. George B. Bassett. Later Mr. Bassett resigned and the Executive Board appointed Mr. Frank N. Speyer in his place.

RECOMMENDATIONS OF MANY MAYORS

Many Improvements Proposed—Streets Cleaned by Machinery—City Should Receive Direct Return from Franchises—Municipal Telephones for Nashville—Filter Plant Satisfactory

WANTS UNPAID BOARDS ABOLISHED

Mayor McNamee of Cambridge, Mass., urged the consolidation of departments and that the unpaid boards be abolished, as they were a serious detriment to the good work of the government. Better results could be secured by placing the departments in charge of the superintendents who would be accountable to the mayor for their conduct.

BOARD OF WORKS TOO LARGE

The debt of the city of Everett, Mass., was increasing much to the regret of Mayor Charles Bruce, the net indebtedness being \$939,635. He urged that a reduction should be made in the number of the members of the Board of Public Works as, on account of the large number, no one is held accountable for any particular department.

GLoucester Must Be Good

A good share of Mayor James E. Tolman's address was devoted to morality, highways and street railways. The license act he characterized as a farce and gave warning that he would stop all gambling and suppress all dives. Despite the expenditure of \$38,313.50 on highways, they are in bad shape. As regards the railways, he said that the rights of the people must be protected as "human endurance can stand no more of the outrageous treatment that we have been receiving."

METERS TO PREVENT WATER WASTE

The abolition of grade crossings should be given prompt attention according to Mayor Murray D. Clement, of Waltham, Mass. To prevent the shortage of water, either a new supply must be secured or meters must be introduced. He favored the latter course.

SHOULD RECEIVE DIRECT RETURN FOR FRANCHISES

What has already been done in the work of improving Harrisburg, Pa., was pointed out in the message of Mayor Vance C. McCormick, as well as what yet remained to be done. He urged that the ordinance calling for about fifteen miles of paving should be carried out, but that the work of improving the streets should not stop there. If care is used the work, including new sewers, could be carried out as planned. A tax rate of seven and one-half mills would be sufficient to care for the sinking fund and interest on the improvement loan. He desired that the control of the streets should be placed in the hands of the city engineer's departments and that all sewers should be built under his direction. All who excavate in the streets should pay an amount for their permits sufficient to enable the city to restore the streets to their original condition. The Mayor recommended that a first-class paid fire department should be established. Street railways should pay more for the privileges they enjoy and should sprinkle and keep in good condition the pavement between their tracks. "The day has passed when public service corporations are considered an experiment. The franchises they enjoy are known to be of great value at the time they are given and the city should receive some direct return for granting and continuing them. Franchises of this kind are of such value that most public service corporations are enabled to greatly water their stock and thereby derive large profits, which are not legitimate returns from legitimate investments, and which should properly accrue to the revenue of the city, to be used for its improvement and to lessen its taxation."

BRICK PAVING TO REPLACE COBBLESTONE

Mayor Price, of Wilkes-Barre, Pa., urged that an increase in the bonded indebtedness of the city be secured to provide for permanent improvements. He recommended that a sum be set aside for the removal of snow and ice from the streets and that provision be made for the replacing of the cobblestone pavements in principal streets by that of vitrified brick. The construction of such sewers as are

necessary should be undertaken at once. He commends the operation of the fire department during the past year and recommends that a new engine house be constructed in the lower part of the city at the earliest possible moment, inasmuch as that part of the city is unduly exposed to fire loss from want of adequate protection.

ROAD ROLLER OF GREAT BENEFIT TO CITY

The use of a road roller in laying street pavements has proved most satisfactory, according to Mayor Gibson, of York, Pa. He opposed any increase in indebtedness except in the line of improvements to highways and water courses. He recommended that the city be divided in such a manner that each section could be placed in charge of a competent person who should be held responsible for the cleanliness of each thoroughfare in his district and who should see what repairs were needed. He urged that free access should be granted to all the sanitary sewers. While the funds would not admit of the erection of a city hall, larger quarters should be secured that all the city offices could be together.

SHOULD PUSH STREET PAVING

Mayor Lansing, of Rensselaer, N. Y., recommended that the paving of the streets should be pushed. A city hall should also be erected and a police and fire alarm system should be installed. The Mayor was in favor of making all the improvements at once and in the payment thereof issue long term, low rate bonds.

FILTER PLANT HIGHLY SATISFACTORY

The message of Mayor Smith, of Binghamton, N. Y., was a lengthy one, but was of unusual interest. Pestilence, floods and the verdict of a jury in a damage case added considerable to the cost of the government during the year. The installation of a modern filter plant has enabled the water department to furnish the city with an excellent quality of water. The results of the working of the plant under extreme conditions, have been highly satisfactory. While there continued to be a great waste of water, the introduction of more meters, this was less than the year previous. The department has accumulated a surplus which the cost of the meters did not reduce materially and the question of disposal of this surplus must be decided. The Mayor recommended that a special election be held to ascertain if a sinking fund should not be created into which a portion of the surplus could go, to eventually reduce the bonded indebtedness of the department incurred for the filtration plant, etc. Mayor Smith recommends that the repairs to dirt streets should be done in the spring instead of in the fall. Much money is wasted on dirt streets if they are left until the fall for repairing, for the winter soon undoes the work and during the next summer the streets are in bad condition, when they should be in good shape. Macadam pavement was recommended for residential streets. The asphalt repair plant that was purchased has a capacity of thirty yards a day and can be used with economy in keeping the asphalt pavements in repair by filling the small holes and preventing their enlargement under traffic. For some of the business streets, brick was recommended. Sewer building should be encouraged as far as possible and the nuisance caused by the pole lines should be abated at once, for the overhead wires seriously handicap the work of the fire department. An adequate system of subways should be installed and all wires in the business streets be placed in them.

CLEAN STREETS DUE TO MACHINE SWEEPERS

Mayor Conway, of Troy, N. Y., devotes a great part of his message to the health department which he considers of the greatest importance to any city. The work of that department for the year is commended, as the death rate is exceptionally low. The police and fire departments were also praised and for the latter the Mayor

urged that two additional fire engines and horses and two new fire engine houses should be installed. The substitution of a single fire alarm system for the entire city in place of the two system has been planned, and the Mayor recommended that these plans be carried out. The use of one size of hose and connections should also be provided, as at present different sizes are used in old Troy and upper Troy. The improved method of using street sweeping machines, cans and can carriers was continued during the year with

excellent results, as shown by the cleanliness of the streets within the districts covered by these machines. During the year the first public bath was opened to the people and proved very popular. No charge is made for either soap or towels. Considerable brick paving is recommended, as well as a new steel bridge. The burying of the wires in the business sections of the city should be carried out fully and each year should see additions made to the districts in which the wires are in subways.

TAR PAVEMENTS IN WASHINGTON

THE paving situation in Washington is more interesting than that of any other city for the reason that the Government has experimented with about every kind of pavement that has ever been introduced in the United States, and some of the lessons learned from these experiments are invaluable. Coal tar pavement was laid in large quantities more than thirty years ago and the following table gives in detail the amount, the year laid, the cost for first construction, date and cost of resurfacing, date and cost of repairs and the total amount of square yards of coal tar pavements still in use in January, 1903. The Engineer's Department of the District of Columbia furnished the data contained in this table. The table was taken from the report for the year ending June 30, 1902, and from

records of the Street Department on file in the office of the Superintendent of Streets, Washington, D. C. It is interesting to note how long and how well some of these pavements have worn. The following summary is made up from the table: There are 6,713 square yards of pavement thirty-one years old; 3,894 square yards thirty years old; 19,628 square yards twenty-eight years old; 4,442 square yards twenty-six years old; 28,664 square yards sixteen years old, and 11,453 square yards fifteen years old, making a total of 74,794 square yards that have been in use from thirty-one to fifteen years. There is an interesting article on this subject in this issue, by Prof. O. W. Dow, Government Inspector of asphalt pavements and cement, of Washington, commencing on page 118.

COAL TAR PAVEMENTS WHICH HAVE BEEN RESURFACED

Street	From	To	Year laid	Area in sq. yds.	Cost per sq. yd.	Year	Cost per sq. yd.	Prior to resurf.	After resurf.	Repairs—average annual cost per sq. yd.		Diff. cost of repairs before and after.	Age before resurf.	Area resurf.
										Resurfaced.	June, 1901, to June, 1902.			
Corcoran	O and R	13th and 14th	1877	2,067	\$2.18	1896	\$1.46	\$0.03	\$0.052	\$0.049	\$0.022	19	All.	All.
D, N. W.	New Jersey Ave.	4th	1878	3,818	3.00	1883	1.51	.071	.085	.025	.014	8	All.	All.
E, N. W.	8th	19th	1873	1,642	3.20	1878	1.44	...	.022	.022	...	5	All.	All.
H, N. W.	13th	14th	1872	2,144	3.20	1886	1.81	.022	.04	.055	.018	14	All.	All.
H, N. W.	Penna. Ave.	22nd	1872	6,493	3.20	1880	1.262	.014	.019	.019	.005	8	All.	All.
Mass. Ave.	14th	20th	1873	13,898	3.20	1892	.17	.015	.043	...	.028	19	1,749	9,467
New York Ave. (N. side)	14th	15th	1872	1,862	3.00	1895	1.61	.031	.056	.00	.025	23	All.	All.
New Jersey Ave.	M	Florida Ave.	1887	18,127	1.99 1/2	1895	.415	.037	.067	.023	.03	8	All.	All.
O, N. W.	New Jersey Ave.	Vermont Ave.	1875	13,361	3.20	1902	.566	.018	.05	.042	.032	6	4,755	All.
P, N. W.	22nd	Rock Creek	1872	1,078	3.20	1881	1.30	.012	.108	.01	.096	9	All.	All.
Pierce Place	S and T	14th and 15th	1873	2,154	3.20	1886	1.65	.033	.045	.00	.012	13	All.	All.
Q, N. W.	14th	16th	1874	4,806	3.20	1886	.705	.006	.065	.0022	.005	12	2,127	2,679
Q, N. W.	16th	17th	1875	2,301	3.00	1895	1.415	.027	.013	.018	...	18	1,890	2,486
S, N. W.	14th	16th	1873	4,214	3.20	1889	.55	.023	.051	...	.028	16	1,757	1,757
10th, N. W.	G	K	1875	4,828	3.00	1894	.893	...	.036	.0197	...	21	1,224	All.
11th, N. W.	G	K	1875	3,866	3.00	1898	.59	.045	.067	.015	.022	23	All.	All.
12th, N. W.	F	N	1875	13,039	3.00	1889	.117	.005	.04	...	.035	14	7,868	7,868
13th, S. W.	B	Maryland Ave.	1875	5,706	3.60	1891	1.27	.021	.032	.002	.011	16	5,347	5,347
14th, N. W.	B	Penna. Ave.	1887	8,852	1.97	1894	.464	.049	.121	.034	.072	7	1,869	1,869
14th, N. W.	F	New York Ave.	1873	3,732	3.20	1884	1.546	.008	.053	.055	.045	11	690	3,036
14th, N. W.	New York Ave.	H	1874	1,549	3.20	1895	...	.022	.023	.012	.001	21	246	All.
15 1/2, N. W. (Madison Pl.)	Penna. Ave.	H	1872	2,974	3.20	1880	.42	.00	.031	.0054	.031	8	All.	All.

COAL TAR PAVEMENTS STILL IN USE, JANUARY, 1903

17th, N. W.	B	E	1872	6,713	3.20	...	...	.036	...	.002	...	31	...
Triangular Reservation	East of 20th St.		1873	2,646	3.20	...	...	.025	...	.00	...	30	...
Mass. Ave.	Highland Terrace	14th to 15th	1873	1,248	3.20	...	...	.005	...	.016	...	30	...
De Sales	17th	Connecticut Ave.	1875	2,493	3.70	...	...	.012	...	.004	...	28	...
Madison St.	P and Q	15th and 17th	1875	2,674	3.00	...	...	.032	...	.118	...	28	...
O, N. W.	15th	16th	1875	1,663	3.00	...	...	.007	...	.03	...	28	...
Penna. Ave. (S. side)	18th	23rd	1875	10,078	3.20	...	...	...	...	...	...	28	...
O, N. W.	Mass. Ave.	21st	1875	883	3.00	...	...	.013	...	.048	...	28	...
Penna. Ave.	Rock Creek	M	1875	1,837	...	...	...	...	...	...	...	28	...
26th, N. W.	Penna. Ave.	M	1877	919	2.67	...	...	.023	...	.018	...	26	...
M, N. W.	Rock Creek	28th	1877	1,138	2.67	...	...	.15	...	.054	...	26	...
New Jersey Ave.	C	D	1877	2,385	2.17	...	...	.077	...	.036	...	26	...
Dumbarton	28th	32nd	1887	3,669	1.98	...	...	.0088	...	.014	...	16	...
G, N. W.	North Capitol	New Jersey Ave.	1887	3,802	1.98	...	...	.034	...	.06	...	16	...
Mass. Ave., N. W.	North Capitol	New Jersey Ave.	1887	5,143	1.98	...	...	.046	...	.097	...	16	...
North Capitol	E	Mass. Ave.	1887	3,856	1.98	...	...	.031	...	.063	...	16	...
O, N. W.	20th	21st	1887	2,011	1.97	...	...	.007	...	.0057	...	16	...
O, N. W.	30th	Valley	1887	3,943	1.98	...	...	.007	...	.055	...	16	...
O, N. W.	Valley	32nd	1887	1,067	1.98	...	...	.026	...	.209	...	16	...
12th, N. W.	Rhode Island Ave.	Vermont Ave.	1887	2,304	1.98	...	...	.048	...	.124	...	16	...
35th, N. W.	N	P	1887	2,920	1.97	...	...	.01	...	.046	...	16	...
O, N. W.	35th	College Gate	1888	2,308	2.00	...	...	.018	...	.034	...	15	...
O, N. W.	New Jersey Ave.	5th	1888	2,031	2.00	...	...	.022	...	.058	...	15	...
R, N. W.	7th	8th	1888	1,602	2.00	...	...	.035	...	.0078	...	15	...
8th, N. W.	S	Florida Ave.	1888	3,624	2.00	...	...	.021	...	.01	...	15	...
12th, N. W.	R	S	1888	1,798	2.00	...	...	.004	...	.031	...	15	...

* North side Rawlins Square. † On account of change of grade, due to removal of street car tracks. ‡ From H to I streets.

Company Need Not Remove Poles

IN a recent Duluth Telephone Company case, the Supreme Court of Minnesota has handed down a decision which holds that the company need not remove its poles and wires from the streets after the expiration of its franchise. The telephone company was granted the exclusive right to put up poles and wires for the period of ten years. After the time limit had expired the Council, in event of the said company refusing to submit a bid for a new franchise, granted a franchise to another company and ordered the removal of the first mentioned company's wires and poles. The Court sustained the defendant company's refusal to remove its property on the ground that the company, having established its plant under the provisions of the general law, has acquired the right to extend its system within the city as occasion might require, and had thus obtained vested rights which could not be revoked by the city except within the exercise of its police power.

State Aid for Good Roads in Pennsylvania

THE Legislature of Pennsylvania has been considering a good roads bill to improve the highways of the State, which is radically different from the good roads act so successful in New York. It provides that the governor shall appoint a state engineer of highways for the term of two years. He must be an experienced road builder and shall receive a salary of \$4,000 and expenses not to exceed \$500 a year. With the approval of the governor, the engineer shall appoint three assistants at salaries of \$2,000 each and expenses not to exceed \$500 per year, and a chief clerk at a salary of \$1,500. The supervisors of each township, which desires to take advantage of the provisions of this act, shall before the first day of April in each year apply to the engineer, stating the roads that they desire to have improved, and if the engineer considers the roads of sufficient importance to the general public to be improved, he shall prepare specifications for the work and secure the approval of the supervisors. Unless the work to be performed does not exceed the sum of \$1,000, the work must be let to the lowest responsible bidder. The township, through its supervisors, shall have the privilege of bidding on the work along with other bidders. If the work does not amount to over \$1,000, the contract may be let without advertising.

When the work is done, the engineer must pass upon it and certify to the contractors and supervisors his approval of the same, when the supervisors shall pay into the State treasury within sixty days 50 per cent. of the contract price. The engineer shall issue a warrant on the State treasury in favor of the contractors if the work has been accepted.

When State aid is desired by the supervisors of any township, it shall be the duty of said supervisors to file with the engineer before the first of April every year a statement requesting such aid and stating the number of miles of stone constructed within their jurisdiction and the condition of the same and the amount of road tax levied in the township. The engineer shall then estimate the amount he considers necessary for the proper maintenance of such roads and pay the supervisors their proportion of the amount hereafter stated, provided that the amount paid by the engineer shall not exceed the amount of the road tax in the township.

The engineer is to reserve \$300,000 of the appropriation herein-after made to maintain roads as stated in the preceding paragraph and this shall be apportioned every year among the various townships applying for the same according to the number of miles of improved stone roads in the townships. The supervisors must report to the engineer the disposition of all moneys paid them for maintenance before the first of March in each year. No road shall be improved under the provisions of this act that is less than thirty-three feet in width.

The sum of \$2,000,000 is appropriated to carry on the work according to this act, but only one-half this amount can be used in any year, the same to come from any money in the treasury not otherwise appropriated. If this amount is not sufficient to meet the requirements of the act, the engineer shall apportion this amount among the townships according to the number of miles of road in each township applying.

English Cities Use Motor Wagons

SLOWLY but surely are English cities adopting the motor vehicle for use in drawing heavy loads. The period of time that has elapsed since some of the cities first put these machines into use has placed the undertaking beyond the stage of experiment. A few firms have been everlastingly keeping at the problem of economical road traction for heavy carting and the results have begun to show in the ever increasing number of these traction engines that are being put into service. The city of Westminster, England, has had in service some



MOTOR WAGONS OF WESTMINSTER

of these motor wagons for a long time and they have given great satisfaction. The accompanying illustration shows three of these wagons which are as heavy as have been made. They are capable of carrying eight tons on their own platforms and of drawing in addition two or three tons on a trailer under favorable conditions. All of the wagons have steel wide-tired wheels and are run by engines that can develop forty-five horse power. As they are destined for all parts of the world where all kinds and conditions of fuel must be used, they are fitted with boilers having very large heating surface of grate area.

Salaries for Ohio City Officials

THE salary question is always an interesting one for the city official at all times, but at present the officials of Ohio cities are especially interested inasmuch as the councils are discussing the questions of salaries for those who are to serve under the new code when it goes and succeeding years, but in the following paragraphs will be found the figures at which municipal authorities are to serve in a few of the cities and towns:

Canton: Mayor, \$1,000 and fees, bond, \$5,000; three directors of public service, \$1,000 each, bond, \$5,000; four directors of public safety, \$250 each, bond, \$1,000; solicitor, \$2,000, bond, \$5,000; auditor, \$1,600, bond, \$5,000; treasurer, \$750, \$750, bond, \$75,000; president of council, \$500, bond, \$1,000; councilmen, \$150, bond, \$500.

Cleveland: Mayor, \$5,000; three members of board of public service, \$4,000 each; two members of board of public safety, \$2,000 each; solicitor, \$5,000; auditor, \$4,000; treasurer, \$4,000.

Columbus: Mayor, \$3,600; three directors of public service, \$3,000 each; two directors of public safety, \$600 each; solicitor, \$3,000; auditor, \$2,500; treasurer, \$3,000.

Dayton: Mayor, \$3,000, bond, \$10,000; three directors of public service, \$3,000, bond, \$20,000; two directors of public safety, \$600, bond, \$10,000; solicitor, \$4,000, bond, \$10,000; auditor, \$2,400, bond, \$22,000; treasurer, \$2,400, bond, \$30,000; president of council, \$500, bond, \$1,000; councilmen, \$350.

Hamilton: Mayor, \$2,500, bond, \$22,000; three directors of public service, \$1,000 each, bond, \$22,000; four directors of public safety, \$300, bond, \$5,000; solicitor, \$1,400, bond, \$10,000; auditor, \$1,200, bond, \$10,000; treasurer, \$1,000, bond, \$150,000; president of council, \$140, bond, \$2,500; councilmen, \$150, bond, \$2,500.

Hubbard: Mayor, \$100 and fees, bond, \$500; clerk, \$100, bond, \$500; treasurer, 2 per cent. of all money paid out, bond, \$3,000; marshal, \$300 and fees, bond, \$500; street commissioner, \$1.50 a day, bond, \$200.

Lima: Mayor, \$1,500, bond, \$5,000; directors of public service, \$1,500, bond, \$5,000 each; directors of public safety, \$150, bond, \$1,000 each; solicitor, \$1,800, bond, \$5,000; auditor, \$1,500, bond, \$200.

000; treasurer, \$900, bond, \$75,000; president of council, \$300, bond, \$1,000; councilmen, \$150.

London: Mayor, \$400; treasurer, \$200; clerk, \$200; marshall, \$500; street commissioner, \$468; fire chief, \$120.

Middletown: Mayor, \$800 and fees, bond, \$2,000; three directors of public service, \$300 each, bond, \$2,000; solicitor, \$800, bond, \$1,000; auditor, \$1,000, bond, \$10,000; treasurer, \$400, bond, \$60,000; president of council, \$50, bond, \$2,000; councilmen, \$50.

Niles: Mayor, \$480 and fees, bond, \$2,000; three directors of public service, \$200 each, bond, \$1,000; two directors of public safety, \$50 each, bond, \$1,000; solicitor, \$600, bond, \$1,000; auditor, \$200, bond, \$1,000; treasurer, \$600, bond, \$25,000; president of council, \$75, bond \$500; councilmen, \$75.

Prospect: Mayor, \$100, bond, \$500; clerk, \$100, bond, \$1,000; treasurer, \$150 and fees, bond, \$2,500; marshal, \$150, bond, \$1,000; street commissioner, \$1.50 a day, bond, \$500.

Sidney: Mayor, \$400; three directors of public service, \$250; three directors of public safety, \$25; solicitor, \$400; treasurer, \$250; auditor, \$750; president of council and councilmen, \$50.

Steubenville: Mayor, \$500; directors of public service, \$750 each; directors of public safety, \$250 each; solicitor, \$800; auditor, \$1,000; treasurer, \$500; president of council, \$5 per night; councilmen, \$3 per night.

Troy: Mayor, \$750; three directors of public service, \$150 each; two directors of public safety, \$24 each; solicitor, \$450; auditor, \$360; treasurer, \$250; president and members of council, \$1 a meeting.

Upper Sandusky: Mayor, \$150; clerk, \$150; treasurer, per cent. of fees; marshall, \$500; street commissioner, \$500.

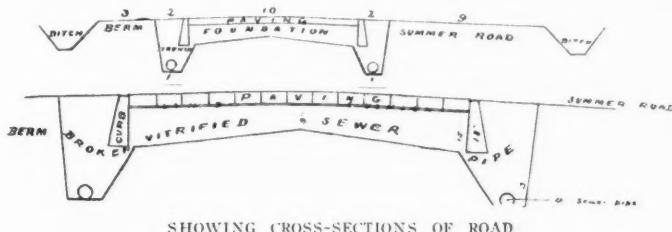
Wapakoneta: Mayor, \$300; clerk, \$350; marshall, \$600; treasurer, \$200; trustees of public affairs, \$50 each; street commissioner, \$2 a day.

Youngstown: Mayor, \$3,500, bond, \$15,000; directors of public service, \$1,800, bond, \$15,000; directors of public safety, \$500, bond, \$1,000; solicitor, \$2,000, bond, \$10,000; auditor, \$2,000, bond, \$10,000; treasurer, \$2,000, bond, \$100,000; president of council, \$500, bond, \$1,000; councilmen, \$150, bond, \$500.

Paving a Country Road

ONE way of paving a country road economically and to secure a durable highway has been explained by Sam Huston, C. E., of Steubenville, Ohio. While the conditions surrounding the road which was constructed under his direction are in many respects different from those about most highways, this road furnishes an object lesson which may be utilized in many other cases.

The road was located along the Ohio River and was subject to frequent inundation when the river rose. Consequently it was subjected to a severe test of washing, not usually found in other roads.



SHOWING CROSS-SECTIONS OF ROAD

The foundation was made of waste product from a near-by paving brick yard and in this were laid four-inch glazed fire clay sewer pipe drains, having lengths of two feet. These were placed three feet below the foundation grade of the road. The grade of the road was from three to twelve inches to each one hundred feet. For a distance of about 1,600 feet the pavement was laid over six feet of this waste material, which, with the sewer pipes, gave the best of drainage. This waste material was broken vitrified sewer pipe of about two and one-half-inch diameter, with enough fine material to fill the voids when rolled, which was done with an eight-ton roller. The finer material was furnace cinder. The sides of the road were curbed with specially designed paving brick, eight inches high, three inches wide on top and seven inches wide at the base, and about two feet long. These were made hollow so as to insure thorough burning and lightness. On top of the foundation was spread a cushion of

clean, dry sand to a depth of one inch. Upon this was laid the paving brick, which was Ohio River fire clay paving brick. These were rammed closely together and covered with fine dry sand, well broomed in. They were then rolled with a five-ton roller and finally evenly covered with one-half inch of dry sand.

The final estimate for doing this work was as follows: 10,334 cubic yards of excavation at 12 cents per cubic yard; 47,490 cubic yards of over haul at 1 cent; grubbing trees, \$1.00 each; 8,012 feet of 4-inch sewer pipe at 6 cents per foot; curbing, 10,784 feet at 20 cents; 3,413 cubic yards of foundation at 22 cents; 6,243 square yards of paving at 52 cents, making a total cost of \$8,367.72. The total length of the road was a little over a mile.

True Value in Assessments

THE question of true or market values in making assessments was discussed in the last report of the New Jersey State Board of Taxation by Mr. Charles C. Black a, member of the Board. We have picked out of the main points made by Mr. Black in the following paragraphs

The constitution of the State provides that assessments shall be made according to "true value" which, according to the interpretation of the courts, is what the property would sell for at a fair, private sale at the time of making the assessment. It is comparatively easy to ascertain, with reasonable accuracy, the value of some farm or house and lot, because they are constantly changing hands, but the difficulty of applying this expression to a building built for a special purpose, like a bank, or to a line of telegraph poles, or a trolley road, gas or water plant, which have little value if separated from the rest of the system, will be readily appreciated. These do not change hands often and are of value according to their franchises.

In valuing the franchise for taxation the law provides two per cent. of the gross receipts and the State Board of Taxation requires that the companies furnish itemized and sworn statements of the cost of reproducing the property belonging to said companies so that the assessors may investigate and assess according to this value. Regarding the franchise itself, the municipal assessors have nothing to do with it, for value of the tangible property and not the franchise is what concerns them. This point often causes confusion not only with the assessors, but also with the courts, for they have considered that a street car rail is worth more in certain streets when, in fact the value of the rail is the same in any street, the franchise giving value according to the location. So, in determining the true market value of property owned by quasi-public companies, the practical method is to assess to cost of reproducing the tangible property less depreciation. The law grants assessors the power to serve blanks on these companies and demand a return of the value of their property. The State Board of Assessors issues a circular giving the cost of property with which the assessors have to deal and based on the average cost of construction of plants.

It is often stated by an assessor that he has assessed property at seventy or ninety per cent. of true value, when in reality it is assessed at its true value, minus a fair difference of opinion respecting some exceptional pieces of property. It is not practicable for the assessors to go over every bit of property in every year and raise or lower it slightly so as to conform to the rise or fall of real estate in any certain locality, but it is the practical method to ascertain a fair average which normal condition would sustain. Much of the property is so assessed in New Jersey. In the case of manufacturing plants and the like, where the machinery is subject to depreciation and the building cannot be readily converted into other uses than that for which it was erected the very nature of the property would fix its true value at an average less than the cost of acquisition and reproduction. The fact that certain property is not assessed as high as would seem right is, not because the law allows any percentage of the true value to be assessed, but because the true value is not what would appear on the face of it. The first consideration of every assessor should be equality of assessment as well as equality between the different taxing districts. If these points were carried out the result would be a very low tax provided affairs were economically administered. The equality that values the property of the individual and the corporation on the same standard and that values like or similar property at like values is the most important qualification,

Good Roads Bill for Delaware

THE House of Representatives of the State of Delaware has been considering a bill in the interests of good roads. The act calls for a commissioner of public highways to be appointed for the term of four years by the judges of the counties of New Castle, Kent and Sussex and he is to receive an annual salary of \$2,000 and shall file a bond of \$5,000. His duties shall be to keep an account of all money expended by the State or county. All surveys are to be submitted to the Levy Court of the county in which the section of road is to be, together with the cost and specifications of the work. When the Levy Court and the commissioner of public highways shall have approved the plans, the Levy Court shall advertise for bids for the work. Permanent roads constructed are not to be less than twelve nor more than sixteen feet in width and the minimum width of the right of way shall be thirty-three feet. All contracts for the improvements of the roads are to provide for their maintenance for one year from completion. A supervisor is to be appointed by the commissioner to see that the work is done properly, and he is to receive a salary of \$3 a day. Before the 13th day of June in each year it is to be the duty of the Levy Court of each county to ascertain one-half the estimated cost of all work for which contracts have been awarded during the year and, if any deficiency has accrued for the work already done in the preceding year, the annual tax budget must contain sums equal to the deficiency to be raised by taxation. If the deficiency be due to the cost exceeding the estimate, or in consequence of the receipt of less than one-half of the cost from the State treasurer, the Levy Court shall have authority to borrow on a temporary loan to cover the deficiency until the next annual tax shall have been assessed. Any road improved under the provisions of this act, shall become a public road forever, except it be within the limits of a city. The Levy Court shall provide for the maintenance of all improved roads and any section of improved road within a city shall be maintained by the municipality.

Meeting of Ohio Municipal League

THE annual meeting of the League of Ohio Municipalities was held at Dayton, February 10, 11. It was the intention of the League to have an excursion and banquet on the 12th, but so many of the delegates left for home that these were abandoned. The delegates were late in arriving so that the session could not begin on time as scheduled, but the papers presented at the sessions held, were of great interest to Ohio officials inasmuch as they had reference to the workings of the new code in that State. The addresses were as follows: "The Code in Its Relation to Municipal Economy," by Hon. S. W. Bennett, Special Counsel Attorney General; "Municipal Legislation," by Hon. W. F. Orr, City Solicitor of Xenia; "Application of the Code to the Villages of the State," by Hon. E. H. Kerr, Solicitor of Tipppecanoe City; "Legislatures and Municipal Reform," by Hon. W. H. Thompson, Senator, Columbus; "Specific Duties of the Executive and Legislative Departments," by Hon. S. H. Bell, Solicitor, Carthage; "The Board of Public Service," by Hon. Wade W. Ellis, Assistant Corporation Counsel, Cincinnati; "The City Solicitor," by Hon. Edwin P. Matthews, Solicitor, Dayton; "How the New Code Affects Workhouses," by J. S. Walters, Superintendent of the Workhouse, Columbus; a special paper by Harvey S. Chase on "The New System of Accounting;" "The Powers of the City Councils Under the New Code," by Hon. M. O. Burns, City Solicitor, Hamilton; "The Auditor and the System of Municipal Accounting," by Hon. W. C. Cussins, Director of Accounts, Columbus; "Civil Service Features of the New Code," by Hon. Charles Lynch, Bellaire; "Assessments Under the New Code," by Hon. M. A. Genuender, Secretary of the Sinking Fund, Columbus.

The excursion to various interesting points of the city was omitted as was the banquet, and the officers for the ensuing year were elected as follows: President, Mayor L. G. Silbough, Lancaster; vice-president, Emil Schmidt, Bellaire; treasurer, ex-Mayor J. L. Orbison, Carthage; secretary, Dr. S. O. Giffen, Columbus; trustees, Mayor C. W. Linkhart, Xenia; W. C. Wilson, Niles, and E. J. Hammerstein, Columbus. The next place of meeting is to be Bellaire.

Statistics of Arc Lighting in United States Cities and Towns

Population, 1900.	Watts at lamp terminals.						Hours burn per year.	Cost coal per ton.	Contract price per lamp per year.
	No. lamps.	Open.	Closed.	Open.	Closed.	Schedule.			
ILLINOIS									
Clinton	4,452	...	100	...	480	(1)	4,000	\$1.97	\$7.00
Cornell	521	...	2	...	...	(3)	1,825	1.50	66.00
Danville	16,354	...	220	...	480	(2)	2,400	1.30	30.00
De Kalb	5,904	...	8	...	550	(1)	4,000	2.20	90.00
Dixon	7,917	67	...	480	...	(2)	3,700	2.60	80.00
Earlville	1,122	25	3	340	550	(2)	2,179	2.25	60.00
Edwardsville	4,157	45	...	480	...	(1)	4,000	1.35	80.00
Elmwood	1,585	70	...	480	...	(2)	1,220	.75	50.00
Erie	768	...	2	...	...	(2)	1,220	1.85	60.00
Fairbury	2,187	...	6	...	...	(1)(2)	2,179	sl	102.00
Fairview	501	...	4	...	...	(2)	2,000	1.50	72.00
Freeport	13,258	...	100	...	430	(1)	3,940	2.25	80.00
Fulton	2,685	26	...	480	...	(2)	2,100	2.66	88.00
Gibson City	2,054	...	4	...	...	(2)	1,220	1.68	84.00
Gillespie	873	...	14	...	550	(2)(3)	1,220	.83	75.00
Gilman	1,441	...	26	...	550	(1)	3,650	1.50	70.00
Greenfield	1,085	18	...	480	...	(2)	2,179	1.50	71.00
Harrisburg	2,202	21	...	480	...	(2)	2,179	.90	90.00
Harvey	5,395	125	...	340	...	(4)	2,500	2.00	60.00
Havana	3,268	...	55	...	430	(1)(2)	2,179	1.05	72.00
Highland Park	2,806	68	...	340	...	(2)(4)	1,550	3.00	60.00
Hillsboro	1,937	26	...	480	...	(2)	2,179	1.20	80.00
Jacksonville	15,078	184	...	480	...	(2)	2,500	1.83	z
Joliet	29,353	284	...	480	...	(1)	4,000	W. P.	90.00
Kankakee	13,595	136	...	480	...	(4)	2,190	W. P.	60.00
Kewanee	8,382	...	45	...	550	(2)	2,500	2.20	70.00
Kimmundy	1,221	...	30	...	430	(2)(3)	1,220	1.10	60.00
Knoxville	1,857	35	...	340	...	(2)(3)	1,400	2.00	43.45
La Grange	3,969	60	...	340	...	(2)	2,100	2.03	60.00
La Harpe	1,591	...	15	...	550	(1)	4,000	2.50	60.00
Lebanon	1,812	...	18	...	550	(2)	2,179	1.03	z
Lemont	2,449	33	15	340	...	(2)(3)	1,385	...	75.00
Lewistown	2,504	...	36	...	480	(2)(3)	1,220	...	51.43
Litchfield	5,918	65	...	480	...	(1)	4,000	1.00	69.00
Macomb	5,375	19	5	340	430	(3)	2,179	2.00	72.00
Marion	1,213	13	...	...	...	(2)(3)	1,350	1.60	84.00
Marseilles	2,559	30	...	480	...	(1)	4,000	W. P.	66.00
Marshall	2,077	43	...	480	...	(1)(2)	2,179	1.50	80.00
Mason City	1,800	60	...	340	...	(2)(3)	1,500	1.25	60.00
Mattoon	9,622	122	...	480	...	(2)	2,572	.85	z
Maywood	4,532	55	5	480	...	(2)(3)	1,385	3.00	72.00
Mendota	3,736	25	5	480	430	(3)(1)	1,825	2.30	5-120
Metropolis	4,069	42	...	480	...	(2)	2,179	1.65	z
Minonk	2,545	6	...	340	...	(2)(3)	1,135	1.50	60.00
Moline	17,248	380	25	480	...	(1)	3,900	2.00	72.00
Monmouth	7,460	...	107	...	480	(2)(3)	1,220	2.18	66.00
Monticello	1,982	22	...	480	...	(2)	18-1,825	1.55	73.33
Morris	4,273	20	...	480	...	(2)	2,336	2.35	60.60
Mound City	2,705	26	...	480	...	(2)	2,500	2.10	72.00
Nokomis	1,371	22	...	480	...	(2)	2,179	1.20	75.00
Normal	3,795	62	...	240	...	(1)(2)	2,400	1.80	48.00
Ohio	461	12	...	425	...	(3)	1,825	2.51	65.00
Oregon	1,577	6	...	...	...	(2)	2,179	W. P.	54.00
Ottawa	10,588	140	...	480	...	(1)	4,000	(5)	z
Paris	6,105	...	94	...	480	(2)	2,830	2.20	245.00
Paxton	3,036	...	34	...	...	(1)(2)	2,179	2.15	72.00
Pekin	8,420	110	...	480	...	(2)	2,318	1.35	65.00
Peoria	56,100	527	...	480	...	(1)	4,000	1.40	59.00
Petersburg	2,807	65	...	340	...	(2)(3)	1,220	1.35	48.00
Pinckneyville	2,357	27	9	320	430	(2)	2,250	1.00	85.00
Pontiac	4,266	...	36	...	430	(1)	4,000	1.00	72.00
Quincy	36,252	300	50	480	430	(2)	2,600	1.60	60.00
Rock Falls	2,176	30	...	480	...	(1)(3)	1,135	2.00	250.00
Rockford	31,051	...	410	...	480	(1)	4,000	1.80	(6) 52.00
Roodhouse	2,351	36	5	480	550	(1)(2)	2,179	1.85	90.00
Rossville	1,435	7	8	430	430	(2)	2,179	1.75	75.00
Rushville	2,292	35	...	480	...	(2)(3)	1,600	1.34	53.45
Savanna	3,325	65	...	480	...	(1)(2)	2,179	2.40	80.00
Sheffield	1,265	...	3	...	430	(2)	2,179	2.00	54.00
Sheldon	1,103	...	10	...	550	(2)	2,250	2.10	72.00
Spring Valley	6,214	46	...	200	...	(2)	2,600	1.15	72.00
Staunton	2,786	35	...	480	...	(2)	3,600	.97	z
Sterling	6,309	8	...	480	...	(1)	4,000	2.75	80.00
Streator	14,079	93	...	480	...	(1)	4,000	1.15	90.00
Sullivan	2,399	42	...	480	...	(2)	2,600	1.50	90.00
Sycamore	3,653	61	4	480	430	(3)	1,825	2.45	z
Toulon	1,057	21	...	340	...	(2)(3)	1,220	1.00	55.55
Trenton	1,706	19	...	480	...	(2)	2,179	.65	z
Tuscola	2,566	...	6	...	...	(2)	2,179	1.65	78.00
Washington	1,459	...	31	...	340	(2)(3)	1,200	1.00	60.00
Watseka	2,505	30	...	340	...	(2)	2,250	1.35	78.00
Waukegan	9,426	122	22	480	550	(2)	2,179	2.35	75.00
Wenona	1,486	23	5	300	430	(1)(2)	2,179	...	72.00
Wheaton	2,345	43	7	480	...	(2)(3)	1,135	3.00	z
Woodstock	2,502	100	100	...	...	(2)	2,179	3.12	z

INDIANA

Albany	2,116	21	5	480	430	(2)(3)	2,200	Gas	49.50
Albion	1,324	36	...	480	...	(2)(3)	1,220	2.70	z
Angola	2,141	30	...	480	...	(2)(3)	1,220	2.55	60.00

(1) All night. (2) Moon scale. (3) Midnight. (4) After midnight up to 1 or 2 P. M. The difference in time may be judged from the column showing number of hours lamps burn. z Municipal plant. (5) Rent power. (6) City owns pole line. SI. Slack.

The data given in the above table were collected by the General Electric Company, Schenectady, N. Y. (To be continued.)

NEWS AND PRACTICE AMONG THE CITIES

Ogden Reduces Expenses—Good Roads in New York—Cheap Sidewalk Specifications—Home Rule for Memphis—Success with Chicago's Municipal Lighting Plant

Must Not Damage Asphalt Streets with Oil

In order to protect the asphalt streets in the city, the Council of Harrisburg, Pa., has passed an ordinance regulating the carting of kerosene, benzine or other similar oily substances through the streets. It is unlawful for any one to pour or spill on asphalt pavements any of the above liquids, and all wagons used for the delivery of oil must have, underneath the faucets, an absolutely oil-tight zinc-lined tray, and in filling any measure from said faucets, the vessel must be held so that the overflow or spill will fall into the tray. A fine of \$25 or imprisonment for thirty days is to be the penalty for violations of the ordinance.

Big Trunk Sewer for Jersey Cities

A PLAN for the redemption of the Passaic River between Paterson, N. J., and its mouth from its present condition of filth and pollution has been reported to the Legislature of the State by the Passaic Valley District Sewerage Commission. Twenty municipalities are interested in the problem. The Commission is in favor of a big trunk sewer to run from Paterson Falls, through Newark, across Newark Bay and out into New York Bay at Robin's Reef. The estimated cost of the sewer is placed at \$8,800,000 including pumping stations. There would be two small stations and one large one on the Newark meadows to force the sewage under Newark Bay. The expense of construction would be met by the municipalities concerned, divided according to their assessed valuation, and the expense of maintenance would be divided according to the amount of sewage contributed by the various places. The plan contemplates the discharge of the sewage into a channel eleven fathoms deep and in a swift tideway.

City Expenditures Greatly Reduced

THE city of Ogden, Utah, is to be congratulated on the great saving in municipal expenses that have been effected during the past year. In the message of Mayor Glasman it is stated that the total floating debt, including a water judgment and interest, amounted to \$86,846.65 one year ago. On January 1, 1903, this total debt had been reduced to \$16,684.21. Deducting from the first amount the sum of \$21,432.49, as the difference between the amount of cash in the treasury this year and last, the net reduction of the public debt is \$48,729.95, nearly \$1,000 a week. In nearly all of the departments the expenses were cut down where inspection showed extravagance. The mayor's contingent fund, amounting to nearly \$5,000 a year, was entirely wiped out. The police department cost \$17,699 for the year and was able to have a balance from receipts of \$3,000. The expenditures for the fire department for 1901 amounted to \$47,087 while for 1902 the department cost the city but \$18,109. These are only some of the instances where the expenses of the city have been considerably pruned. It is to be hoped that the city government will not go to the other extreme and handicap necessary improvements in the desire to economize too much.

Good Roads Improvements in New York

THE work for the improvement of the highways in New York State has been progressing at a good rate during the past year. From 1898 when an appropriation of \$50,000 was made by the Legislature to carry on the work, up to 1902 with an appropriation of \$795,000, 186 miles of roads have been completed. In these years the different counties have appropriated the total sum of \$3,341,964.96 to make up their share of the improvements and 2,415 miles of roads have been petitioned for, 825 miles having been covered by plans of the roads adopted by the counties. Up to January 1, 1903, the State has appropriated sufficient money to provide for its one-half of 355 miles

of the 825. There are now under contract and about ready for completion 169 miles. The remainder of the 825 miles will be taken up as soon as the Legislature appropriates the money necessary. The counties have already made their appropriations for this amount of road and contracts will be let for them when the money is provided. About twenty-five counties will thus receive stretches of good road varying from a half to thirteen miles each in length. The value of the good roads to the agriculturalists is shown in a speech of Mr. William Pierpont White to Governor Odell in behalf of the supervisors of the State at their annual meeting last January. He said, that farm values had shrunk \$80,000,000 in the last few years, and that road improvement would have prevented this. A resolution was passed by the supervisors calling for an appropriation of \$50,000,000 for good roads, one-half to be borne by the State.

Cities May Not Establish Municipal Coal Yards

THE extended discussion over the establishment of municipal coal yards on account of the recent coal famine, crystallized in Massachusetts in a number of questions propounded by the House of Representatives of the State to the Supreme Court. The questions asked were: would it be constitutional to pass a law granting power to a city or town to buy fuel to sell the same to its citizens at cost, less than cost or at a profit? Would it be constitutional to pass a law permitting a municipality to establish municipal fuel yards, selling the material at cost, less than cost or at a profit? If the answer to these questions be in the negative, does the power so declared as non-existent, apply in the case of an emergency and may the municipalities be considered judges of said emergencies? The Supreme Court returned to the House negative answers to all but the last question. The justices, with one exception, stated that they could conceive of cases when circumstances would justify municipalities in extreme emergencies in establishing municipal fuel yards.

Specifications for Cheap Sidewalks

IN an endeavor to provide sidewalks for the outlying districts of the city of Memphis, Tenn., City Engineer Omberg has prepared specifications that will materially reduce the cost of sidewalks as compared with those laid in the centre of the city. By making a cheaper sidewalk, it is hoped that the suburban districts will be better supplied than at present, cost having stood in the way of these improvements. A digest of the specifications is as follows: Excavations are made to a depth of seven and one-half inches, and all fillings are to be made in thin layers, each thoroughly rammed. Four inches of broken stone or clean broken brick not over two inches in diameter, or firm clean cinders are to be laid on the subgrade for drainage purposes and be thoroughly rammed. On these are to be laid three inches of hydraulic cement concrete composed of one part well-tested Portland cement, two parts of clean sand and broken stone in such quantity that the cement and sand shall fill all the voids in the stone and 10 per cent. of surplus. This concrete is to be thoroughly tamped and trowled over to make it smooth. Lastly a wearing surface of three-fourths inch thickness is to be composed of clean syenite granite ground to pass through a half to three-fourths-inch mesh, one part of fresh Portland cement and three parts of granite. After this is spread evenly on the concrete, a finishing coat of cement is to be sifted evenly on the wet surface and floated down to a level, smooth and uniform surface. The work must be done quickly so that the parts do not set unduly and after it is finished it must be protected from the weather by two inches of clean sand and boards for a period of ten days. The city engineer must approve of the work at all stages before the same shall be accepted.

Millions Needed for New York Sewers

As a result of an investigation made by George Livingston, Commissioner of Public Works of New York City, concerning the sewerage system of the city, it is shown by the Commissioner in his report to Borough President Cantor that the health of the city is seriously threatened and means must be taken to rebuild a great share of the sewer system. The building of the rapid transit subway has interfered with the present system inasmuch as it has cut in two all drainage across the city and will necessitate relaying some of the sewers so that they will drain into either river. It is estimated by Commissioner Livingston that to place the sewers in the proper condition will cost on the average \$50,000 a mile, or not less than \$4,000,000 for the city. At least \$10,000,000 should be spent in the next few years to make every sewer adequate to the needs. In the lower portion of the city where the skyscraper buildings are being put up so rapidly, the old sewers, built in some instances over a hundred years ago and calculated for the needs of that time, are entirely too small to care for the sewage of these big buildings and must be replaced with large sewers.

Municipal Lighting Successful in Chicago

ADVOCATES of the municipal ownership of lighting plants will find much comfort in the report of City Electrician Edward B. Ellicott of Chicago on the operations of his electric lighting plant for the past year. His report is short and to the point and the main points in it are as follows: The total cost of \$53.51 per lamp represents a reduction over the previous year's cost of \$3.97, or a total saving of \$17,896. Higher wages and prices of materials have prevented a greater saving. The average number of lamps operated was 4,508 at a gross cost of \$241,224.11. If these lights had been rented from a private concern they would have cost the city \$452,837, leaving a difference of \$283,612.98 in favor of municipal ownership. Since December, 1887, the cost of the plant for construction and operation has been \$3,400,679.65, while to have rented the same number of lights would have cost for that period, \$3,535,875.50, thus the cost of the plants has been saved in the operation of the system, with exception of a small amount of interest to be charged against the plants for such years as the plants cost more than the rented lights would have cost. This is the largest municipal lighting plant in the country and, according to the report, "the city has not issued any bonds nor increased its taxes for the purpose."

A Crusade Against Mosquitos

A CRUSADE has been carried on against the anopheles at the town of Jagdalpur, the capital of Bastar State in the Central Provinces, India. The soil on which the town is built is a porous laterite and in its immediate vicinity are eight tanks with an aggregate area of nearly one square mile of water. The area under houses is 230 acres. There are between nineteen and twenty miles of *kutcha* drains, and up till last year there were pits in nearly every compound. The town, which has a population just under 5,000, has up till recently been a fever-stricken spot, no less than 28 per cent. of the patients treated in the hospitals being for malaria fever. From the conditions as mentioned above it will be evident that the task of killing off the anopheles did not promise much success. However, mosquito brigades were formed and set to work last year, and if there is anything in figures, their efforts have been most patently successful. In the last five months of the year there were only 1,463 cases of malaria treated, against 3,405, 4,991 and 3,101 in the corresponding periods of 1901, 1900 and 1899, respectively, and the percentage of cases of malaria fever to total cases for these five months was only 11.55, against 27.90, 37.04 and 40.08 in the preceding years.—*Indian Municipal Journal*.

"The Municipal Mecca"

BATTERSEA, London, Eng., is ever introducing something new in municipal ownership. Its member in Parliament gave it the above name because every one interested in municipal government is almost certain to visit it to study how it runs its municipal schemes. The inhabitants of the district are plain workmen, as well as gov-

erning officers, but their energy makes up for their lack of culture. Some of the utilities that are operated by the municipality are given below. In the town hall there is a pipe organ on which weekly recitals are given, free to all. There are also maintained a choir of 100 voices and a stringed orchestra. A "recreation room" has been established where all sorts of games can be played, lantern lectures are given there, etc., and the admission is only a penny a night. Battersea owns its own electric lighting station, a dust destroyer in which all the waste of the district is destroyed, a system of public baths, a public library and a gymnasium. A municipal trolley line and model dwellings are now building. The recreation room and the gymnasium are potent factors in clearing the street corners of their crowds of young men. For the last few years the infant death rate has been increasing in the district and the main cause has been bad milk and dirty bottles. So the officials opened a station where the best milk is bottled and distributed among the poor. Each customer can obtain nine hermetically sealed nursing bottles of sterilized milk every day at a charge of about thirty cents a week and the station collects the old bottles and supplies clean ones. The cost is about \$3,000, but 200 customers a week clears the expense.

Memphis Fighting for Home Rule

THE city of Memphis, Tenn., has been fighting for home rule during the past month, every possible pressure being brought to bear upon the Legislature to force through the amendments to the city's charter that are desired and considered absolutely necessary by the city officials. The amendments are simple and plain and are such as are in force in most cities of the country. They authorize taxing districts to regulate and control the charges of all public utilities companies operating within such taxing districts; to fix the succession of mayor and vice-mayor in an event of vacancy in one of these offices and to abolish the office of the chairman of the board of public works; to permit the board of police and fire commissioners to make contracts for materials, supplies or services without advertisement, where the amount of such purchase does not exceed \$1,000; to permit the legislative councils of taxing districts to make contracts for public lighting and street sprinkling for a term of years not to exceed five; to allow the board of police and fire commissioners to regulate the scale of salaries of the officers of the police and fire department and to fix the rank and number of such officers; to amend the section of the law prohibiting Memphis from levying more than \$600,000 worth of taxes for any one year; to establish the office of tax collector; to permit the legislative council of taxing districts to become a board of equalization for the purpose of revising the assessments as returned by such tax assessor.

Financial Condition of Rochester Good

THE financial status of the city of Rochester, N. Y., should be a source of self-congratulation on the part of its citizens if one may judge from the message of Mayor Rodenbeck concerning the city's finances. The total assets of the city are placed at \$17,030,191.13 and the total liabilities at \$10,592,573.93. One of the principal items of liability of the city comes from the construction of water works. On January 1, 1902, \$3,183,000 of water bonds fell due and \$182,000 of this sum was paid out of the sinking fund, the rest being refunded at 3½ per cent. for thirty years with the option of redemption after ten years so that the city could take advantage of any reduction in the rates of interest. Mayor Rodenbeck desires to convert the floating debt from promissory notes into a permanent debt at the rate of interest paid on the water bonds. This would save over \$12,000 yearly. The indebtedness of the city is well within the constitutional limit of 10 per cent. of its assessed valuation. The city owns stock valued at \$500,000 and if this be added to difference between the constitutional debt limit and that already reached the city is \$996,551.59 within the debt limit set by the constitution. A recent legal decision permits of a more favorable statement as it allows of the deduction of the sinking funds pledged by law to the payment of specific bonds. If these funds and revenue bonds not retired within five years are deducted, the debt limit is \$735,904.61 within the constitutional limit. Add to this the \$500,000 of stock, and the city has \$1,285,904.61 to spend.

FIREMEN OF NEW ZEALAND

Auckland Building Modern Engine Houses of English Style—How the Firemen Are Provided for—Description of the House

By Our Special Correspondent

DISTANCE is said to lend enchantment to most objects and matters far from home have a fascination about them that is not always due to the real qualities of the things considered. Thus when one mentions New Zealand, visions of cannibals and the Maori, pioneers and savage warfare, rise up before one, though a visit to the islands at the present time would disclose only traces of these former times, and the city of Auckland would be found little different from other English colonial cities.

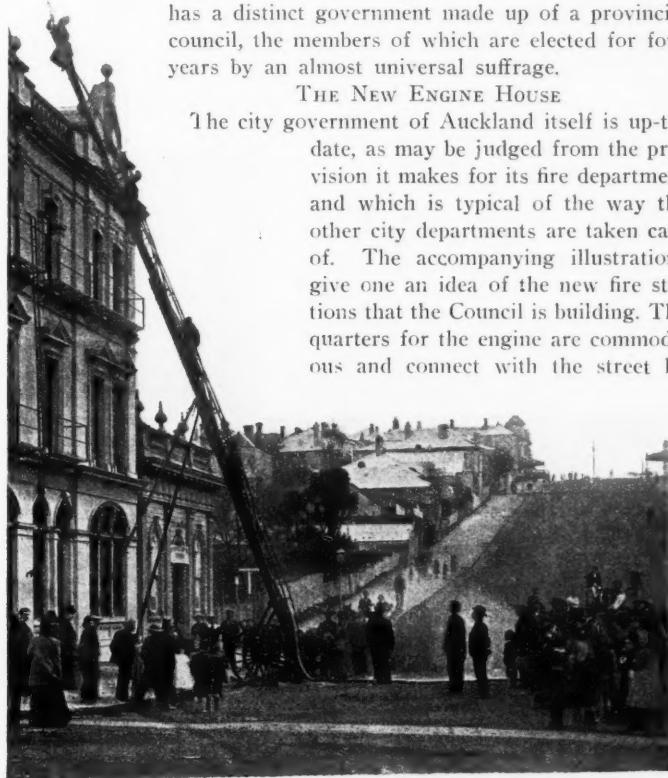
Auckland is built on a series of hills on the northern island of a group in which is to be found some of the most beautiful scenery in the world. It is surrounded by natural canals and has been called a youthful antipodal Venice. The streets are full of heavy grades which makes it difficult for the fire apparatus to get about. While the city is less than sixty-three years old, having been founded in 1840, the population in 1891 had increased to 28,773, and with the suburbs, 51,287, being equal in size to such cities in the United States as Savannah, Ga., Salt Lake City, Utah, or Harrisburg, Pa.

THE GROWTH OF AUCKLAND

As the city has grown, so the character of the houses has increased in pretentiousness until at present, there are many fine buildings such as grace the older cities of Europe and America. The public buildings compare favorably with those of towns of similar size in the mother country; the public schools are the equal of those in England and there are a number of newspapers and periodicals, banks, etc. The villages about Auckland are connected to that city by well-made roads. The land on the island is very fertile and the gold fields are rich in the yellow mineral, but the supply of labor is limited. The English crown is represented by a governor, who is commander-in-chief of all the colonial troops and the government of the colony is vested in him and in a general assembly consisting of a legislative council and house of representatives. Each province has a distinct government made up of a provincial council, the members of which are elected for four years by an almost universal suffrage.

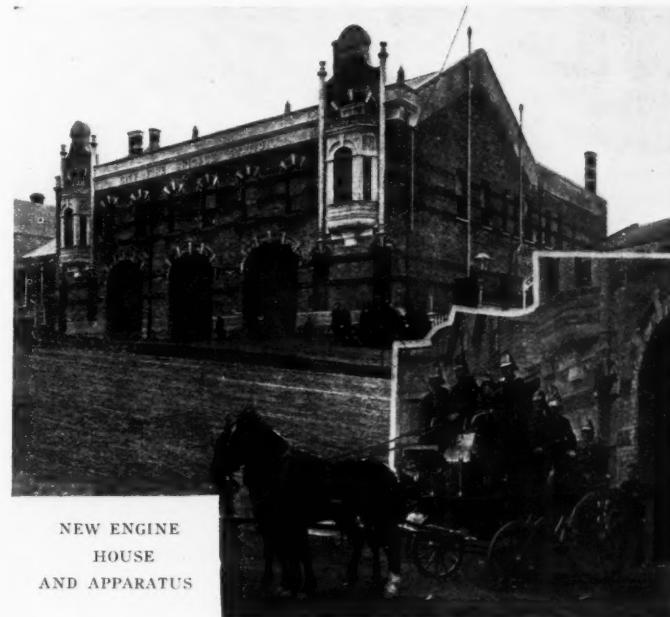
THE NEW ENGINE HOUSE

The city government of Auckland itself is up-to-date, as may be judged from the provision it makes for its fire department and which is typical of the way the other city departments are taken care of. The accompanying illustrations give one an idea of the new fire stations that the Council is building. The quarters for the engine are commodious and connect with the street by



AUCKLAND FIREMEN AT PRACTICE

three double doors. The ceiling is supported on iron girders and columns and the floor is paved with asphalt. The stalls for the horses are placed in the rear as in the modern engine houses in Boston, Mass., and are also similar to those in Boston in that the doors to the stalls are operated by a magneto electrical mechanism by means of which the operator in the watch room can throw them all open at once. There are six of these box stalls and the odor and dust from them are prevented from getting out through the rest of the building because of the closed doors. Up in the front, on the first floor of the building, is placed the watch room and battery room and all the alarms of fire are received there. When the alarm comes

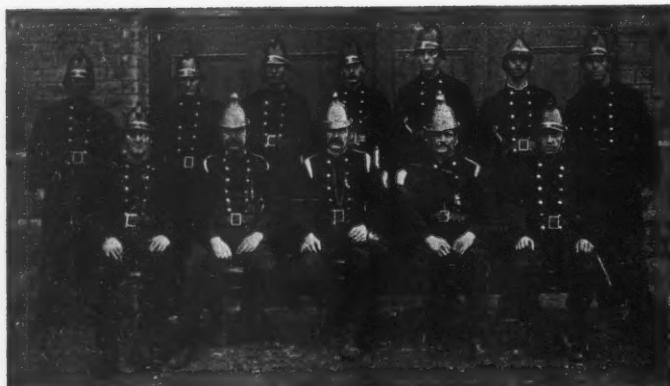


NEW ENGINE
HOUSE
AND APPARATUS

in, the operator, by means of the electrical attachments, flings open the doors of the stalls, setting free the horses, and rings a bell in every room in the building so that every man will be aroused, day or night.

Upstairs there is a hall devoted to social gatherings of the men and a room for billiards and two sliding poles lead from these to the engine room below. Not only will the firemen learn of the alarm of fire, but the whole city will be aroused by the ringing of the six-inch bell on the outside of the building. This is a signal for all traffic on the streets to watch out for the apparatus and give it a clear road. An electric fire alarm system has been lately installed throughout the city and some eighty boxes will enable citizens to notify the engine houses the instant a fire is discovered. The boxes are of the pattern which require the breaking of a glass and the pressing of the button to send in the alarm.

Alongside the watchroom and corresponding to it on the opposite side of the building are rooms used for sleeping quarters for the men, the one on the front of the building being reserved for Superintendent Wolley's office. At the rear of the building is a yard having a concrete surface and allowing exit to the street. Laundries, shops for the carpenter and blacksmith, lavatories, store houses for coal, etc., are directly in back of the engine house and in these buildings are accommodated in the ground floor, the kitchen and dining room, pantries, and other rooms for the men. Two outside and two inside stairways lead to the upper floor where, over the watch room



A GROUP OF AUCKLAND FIREMEN

LONDON'S FIRST MOTOR FIRE ENGINE

THE use of the automobile fire engine has been gaining a foothold in England and thus far, the most satisfactory results have attended their use. The engine shown in the illustration has been in use at the fire station in the Borough of Battersea, (London) for some time and the officials are greatly pleased with its workings. Battersea is noted for its progressiveness and adoption of municipal ownership in every possible way, and it is only consistent with its reputation for it to be supplied with one of the modern pieces of fire apparatus. This

and other rooms, are the quarters for the foreman. These consist of three bedrooms, dining room, kitchen, etc. On the opposite side of the main building is a similar suite of rooms for the convenience of the superintendent. It is proposed to erect a look-out tower in the yard in the near future and this will be utilized for drying the hose.

USES CHEMICAL ENGINE

One of the pieces of apparatus in use is a two-horse chemical engine and hose wagon, built by a local firm. The harness is of a peculiar swinging type, different from those found in the United States. Underneath the pole of the wagon and occupying a space equal to its length and as wide as the gage of the wagon, is a heavy mat for the horses to stand upon. This would also serve as a foothold to enable them to get a good start. Long strips of lighter material also lead from the stall doors to the front of the building alongside the wagon and on this the horses can run, thus saving the wear on the asphalt floor and preventing slipping and noise.

horse power. A single boiler of the vertical fire tube type supplies both engines with steam. The water tank has a capacity of twenty-five gallons. The entire control of the engine is from the front, where all the levers can be reached by the steersman. All the engineer has to do is attend to his boiler and machinery. No coal is used in firing the boiler, oil taking its place. This does away with the carrying of the bulky fuel and enables the steam to be raised in quicker time.



Courtesy, Scientific American, New York.

MOTOR ENGINE OF LONDON FIRE BRIGADE

engine has the power of attaining a speed of thirty miles an hour, which in a run of any length, would save several precious minutes. As will be seen from the picture, the wheel base is very short with the consequent advantage that it can turn within twenty feet. The machine steers very easily for the steering pivots are in the centre of the hubs.

The apparatus is fitted with two engines, one for propulsion and the other for pumping. The former has a capacity of twenty-five

The engine was constructed by the London Fire Brigade at its headquarters in Southwark. When the officials have given a sufficiently long test and are thoroughly satisfied that it will meet every requirement for which it was designed, it is probable that others will be built on a similar line. This is the first motor fire engine that the city of London has constructed and its workings will be watched very closely in order that any defects may be noted and their elimination effected in future engines of this type.

GROWTH OF NEW YORK'S FIRE SERVICE

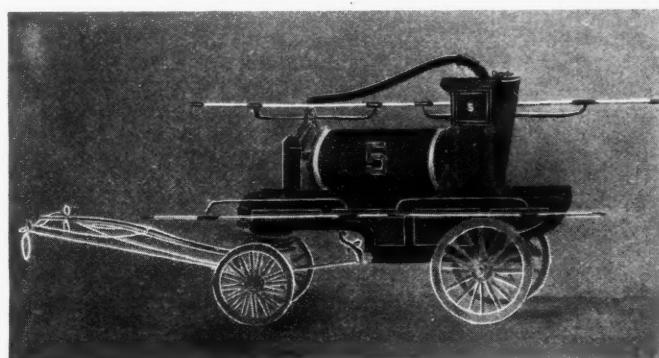
**From the Bucket Brigade to the Modern Steamer—Hand Engines Used for Over a Century
—Next Step the Introduction of the Automobile Chemical**

THE 250th anniversary of the city of New York which was celebrated last month, caused many to stop a moment and review the marvelous growth of the city during the two and one-half centuries of its existence. In no other department of the city has this development been greater than in the fire department and the history of this branch of the city government is one of the most interesting of all.

The very first fire that the inhabitants of New York witnessed, de-

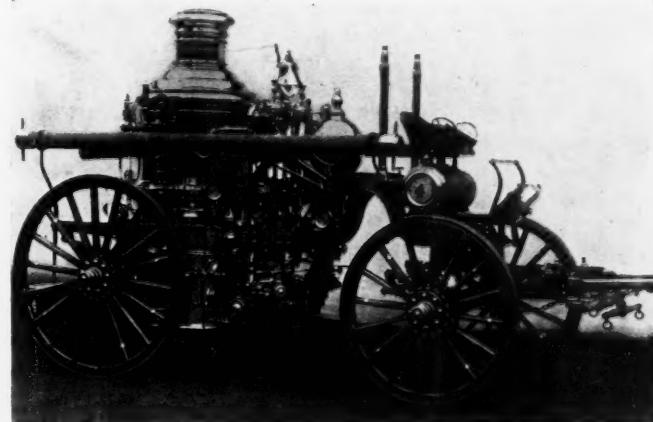
buckets being felt, a tax was levied and two shoemakers were persuaded to undertake the task of making 300 buckets. When finished, fifty of the number were placed at the city hall and the rest apportioned among several of the prominent personages. The burning of a log house where Castle Garden later stood, led to the formation of the first fire company in 1658. It was composed of eight men, supplied with buckets, axes and fire ladders, and each was expected to walk the streets during the night watching for fires. Every house had to keep three buckets full of water on the door step for the use of the watch. The custom of each house having buckets continued in use for some time after the introduction of fire engines. When an alarm of fire was given, the buckets were thrown out of the windows for those hurrying to the fire to pick up.

In 1731 measures were taken by the mayor and aldermen of the city to import two hand fire engines from England. An agreement was made with two merchants to send to England for the engines and when they arrived, they were installed in a room on the lower floor of the city hall, then at Wall and Broad streets. The aldermen and assistant aldermen were in charge of the engines and these and the mayor directed at fires, all citizens being called upon to aid in extinguishing the blaze. The population of the city was then about 8,628, and the number of houses about 1,200. The new engines were made by Richard Newsham, Esq., and accommodated ten men on a side, the well being filled by others from a nearby pump, by means of buckets. The engines were thirteen feet in length, and seven feet wide "on ye board." With slight modifications, one of these con-

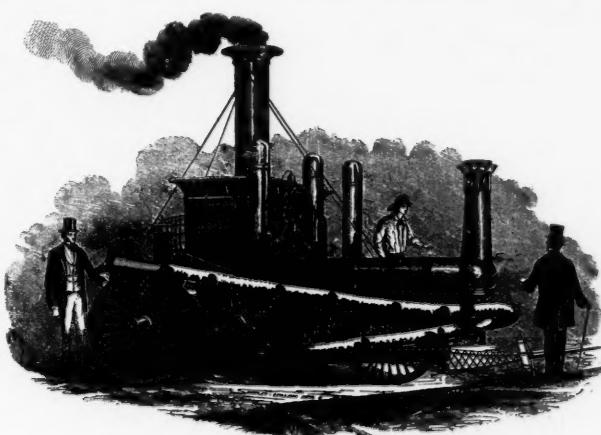


PROTECTION NO. 5.—OLD HAND FIRE ENGINE

stroyed some of their property during the year 1628. At that time the future city of New York was but a collection of huts grouped about a log fort at the southern point of Manhattan Island which had lately been purchased from the Indians for the munificent sum of \$24. The experience of this first fire was not lost upon the settlers for it is recorded that that same year, "the making of brick, lime and potash" was undertaken and the rude huts began to give place to more substantial dwellings. When Peter Stuyvesant was sent over to New Amsterdam as governor in 1647, the settlement was in a bad condition as regards the construction and arrangement of the houses. Stringent ordinances were immediately passed and surveyors of buildings were appointed to enforce them. The sweeping of chimneys was ordered to be carried out regularly, and the abolition of wooden chimneys and thatched roofs was decreed. Despite the vigilance of the surveyors in restricting the erection of buildings except with their approval, the numerous conflagrations caused great anxiety. The water supply for fire purposes was abundant, inasmuch as the settlement was at the extreme southern point of the island and an arm of the bay reached into the island along what is now Broad street up to Wall street, but tubs, pails and buckets were the only means at hand for obtaining the water. The need of regular leather



METROPOLITAN ENGINE—THE MODERN STEAMER



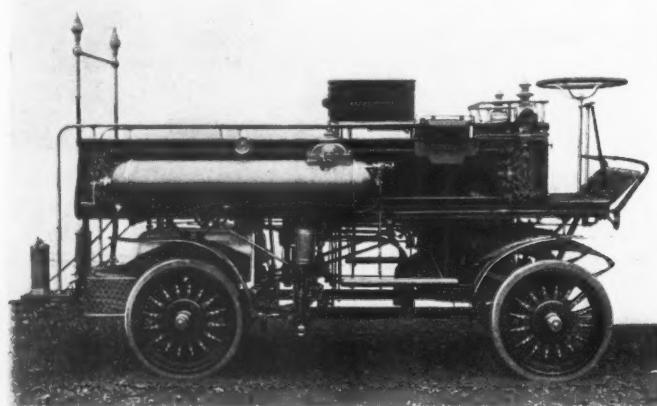
"MILES GREENWOOD," TYPE OF FIRST STEAM FIRE ENGINE

tinued in use for many years. About six years after the introduction of fire engines in New York, they were manufactured in the city and were advertised as capable of delivering "two hogsheads of water in a minute, in a continuous stream."

In December, 1737, forty-two men were appointed as firemen by the corporation of the city and thus began the volunteer fire department that was to continue for one hundred and twenty-seven years. They had entire charge of the fire apparatus and were held responsible for the same and were compelled to attend at all fires under penalty of a fine.

The old hand engine shown on this page was typical of the "goose-neck" hand fire engines that were used in New York and other large cities for upwards of a century. Until the "double-decker" or Philadelphia engines during 1840 and later came into use, this class of engine was exclusively employed. Protection No. 5 was situated in Ann street, New York, and was built by James Smith of New York in 1845. It was demolished at a fire in Ann street on December 28, 1859.

While the hand fire engine did good service for many years in the hands of the volunteer department, it was soon to be supplanted by the steamer. The first steam fire engine was the "Novelty," designed by Captain John Ericson and built by John Braithwart of London in 1829. Other patterns were put out which were more or less successful. In America the first steamer was that constructed by Paul Hodge of New York in 1841, but the excessive weight of this prevented its successful use for fire duty. The first successful steam fire engine and



NEW YORK'S PRESENT NEED—THE AUTOMOBILE CHEMICAL ENGINE

the first to be owned by a city and used in active service, was known as the "Uncle Joe Ross" of Cincinnati, built in 1831. It was designed and constructed by Messrs. Latta of that city at the suggestion of Miles Greenwood, who was subsequently chief of the fire department there.

Boston was the second city to possess a steamer, but this was built in Cincinnati by the Lattas and was named the "Miles Greenwood." The accompanying illustration shows this old style engine. It was

typical of the first steam fire engine built and went into service in Boston in 1855. In a contest in City Hall park with the most powerful hand engine New York possessed, the steamer failed to out-throw the hand engine by a number of feet, but as the distance made by the steamer was maintained for an indefinite time, its superiority over the old type of engine was demonstrated. The "Miles Greenwood" weighed over eight tons and six horses were required to draw it. It was used at three fires during its several years of service, but only to play upon the ruins. While it cost, with repairs, some \$20,000, and did not save a dollar's worth of property, it did demonstrate that steam was better than muscle in fighting fires and paved the way for lighter and improved machines. The "Miles Greenwood" was capable of self-propulsion and so could be termed one of the first "automobile" fire engines made.

The last fifty years has seen a remarkable development in fire appliances. The days of the hand engine are long over. The steamer is no longer an object of curiosity and to-day it is the perfect engine that is shown in one of our illustrations. Still greater improvements have been made in the automobile steamer, rapidly coming into use, and in the automobile chemical engine a picture of which we show. This latter is a combination such as Chief William Ely of Leicester, England, recommended to his Council upon his return from the meeting of the International Association of Fire Engineers held last September in New York. The value of the chemical engine is being realized more and more and numerous fires that can be and are extinguished in their incipiency by these machines have demonstrated the great need for them in all cities. New York is woefully behind the times in this respect. Each section of the city should be provided with an automobile chemical engine and thus enable the firemen to reach the scene of any fire in the shortest possible time and have means at hand to extinguish any small fire once they reach it. Many a dollars' worth of property could be saved in preventing the spread of a fire by the means of the chemical engine while the steamers are being made ready for service.

A PURE MILK SUPPLY IMPERATIVE

A PURE milk supply for a city comes next in importance to a pure water supply. In fact, for the younger generation it is more important and as the milk supply is good or bad so the infant mortality, especially in summer, is small or large. A great hue and cry is continually raised about typhoid and other bacteria in water and great sums are spent to secure the purity of the supply, but the fact is often lost sight of that as much danger to health lurks in the milk as in the water we drink. Unless stringent rules and regulations are enforced by the health officers of cities, it is very easy for the milk to become contaminated with filth and cause an immense amount of sickness, especially among the children. Were the general public as well educated regarding the requirements of pure milk as of pure water, milk dealers would have to live up to rules of sanitation. Spasmodic efforts are made by health boards to purify the milk supply, but the excitement soon dies out and things drop back into the old rut. The indifference and ignorance of consumers is mainly responsible for impure milk.

However, more and more often are crusades made by health authorities against the milk dealers and reports continually come stating that this or that city is striving for pure milk. In Salt Lake City rules were made for dairymen, were printed on cloth and were tacked up on the board of every dairyman about the city. Every place found in a filthy condition was condemned and many such cases were found. The dairies that supply the cities of St. Paul and Minneapolis have been under strict observance of the officials and of the 234 dairies in operation, about ninety are regarded as extra clean, meaning that the cows are kept free from all dirt and as clean as horses. The rest vary from clean to dirty. In the last class were but a few and these were ordered to clean up at once or go out of business. In Indianapolis the health authorities are especially active regarding pure food supplies and two inspectors are constantly on the watch for violations of the milk regulations. Each carry testing

apparatus to determine whether the milk is normal, and of all not so found samples are taken to the board of health for analysis. Part of the sample is left with the dealer, part is kept by himself and the rest sent to the board. To meet the complaint of the dealers that the cows did not give milk that came up to the standard, Dr. Buehler, city sanitarian, has made analyses of 400 samples of milk from cows of all breeds and localities, and none of the samples showed as low a per cent. of fat as is allowed by the regulations.

To prevent the deterioration of their milk until it can be delivered to their customers, dealers are wont to employ preservatives, and of all these substances none is so widely used as formaldehyd, or as it appears in commercial form, formalin. The authorities in cities are continually on the watch to prevent such adulteration and many dealers have been detected and punished for this during the past year. While a small amount is not especially dangerous, it is very easy for an ignorant dealer to add more of this disinfectant than is required and, in consequence, runs the risk of poisoning the one who drinks the milk.

If the proper precautions are taken by the dealers, the use of formalin is not necessary, but these precautions require the most scrupulous cleanliness about the cows and stables and the keeping of the milk at a temperature below 40 degrees Fahrenheit until it is delivered. As soon as the milk comes from the cow it should be cooled rapidly to this temperature and kept so. The methods to be pursued in caring for cows and stables have been defined by the Medical Society of the County of New York and were published in THE MUNICIPAL JOURNAL, Vol. XII, No. 1. Practically all health authorities who have had experience in dealing with the milk supply of cities, concur in these regulations as being the only safe way of preserving the purity of the milk and, if all health authorities would enforce similar rules, no disease could arise from an impure milk supply.

Largest Steam Fire Engine

It is popularly supposed that the American cities have the largest and heaviest fire engines in the world, the automobile engines of Boston, Hartford, Conn., Pittsburg and New Orleans, being monster self-propelling fire pumps. As far as weight goes, the American engines are far ahead of all others. The city of Portland, Me., is having built for it an automobile engine that will weigh 18,000 pounds and have a capacity of 1,550 gallons per minute. Large and heavy as this new engine will be, the city of Liverpool, England, has had in service a horse-drawn engine that will throw over 6,000 gallons per minute more than the Portland steamer and has a weight of but 8,300 pounds, less than half what the American engine will weigh. The accompanying illustration will show the English engine which was delivered to the city authorities by the builders in April, 1893. It is time the American fire engine builders woke up and reduced the weight of their machines. Because of the weight claimed to be required in order to obtain an engine capable of throwing the great amount of water necessary to cope with the modern fire, the fire engines are reaching such a point that horses cannot draw them with

in the suburban districts across the river is to provide for the possibility of a break in the water main under the river. The engines could then use the fire tanks as heretofore. The equipment of the department is as follows: forty-four men, twenty-four horses, three hose wagons, four steam engines, two double and one single chemicals, and a sixty-five foot aerial Hayes truck, all placed in three stations.

For six months in the year the drill tower has been in service and has afforded the best possible training for the men. The need of a salvage corps is becoming more and more evident. As the fire department was organized to save property, the damage from water, which destroys as much as it saves, should be reduced as far as possible. This can only be accomplished by the formation of an efficient salvage corps. Lower rates of insurance would be obtained and the fire losses kept down. During the past year there were 341 alarms and the loss was \$27,871.49.

Rules for Harrisburg Firemen

A NEW set of rules has been prepared for the fire department at Harrisburg by Chief George W. Lutz. Not long since Mayor McCormick had occasion to take away the apparatus of one of the companies because it refused to expel disorderly members at the demand of the Mayor. These rules now prepared by the Chief will tend to prevent the necessity of the Mayor taking any such radical action again. The Chief is to have the power to suspend any company violating the city ordinances or any fire department rule. He is to pass upon all apparatus to be purchased for the department and all tests of the same. No more water than is absolutely necessary is to be used and in case chemical apparatus is on the ground at any fire, that is to be used in preference to water unless the fire has gained considerable headway.

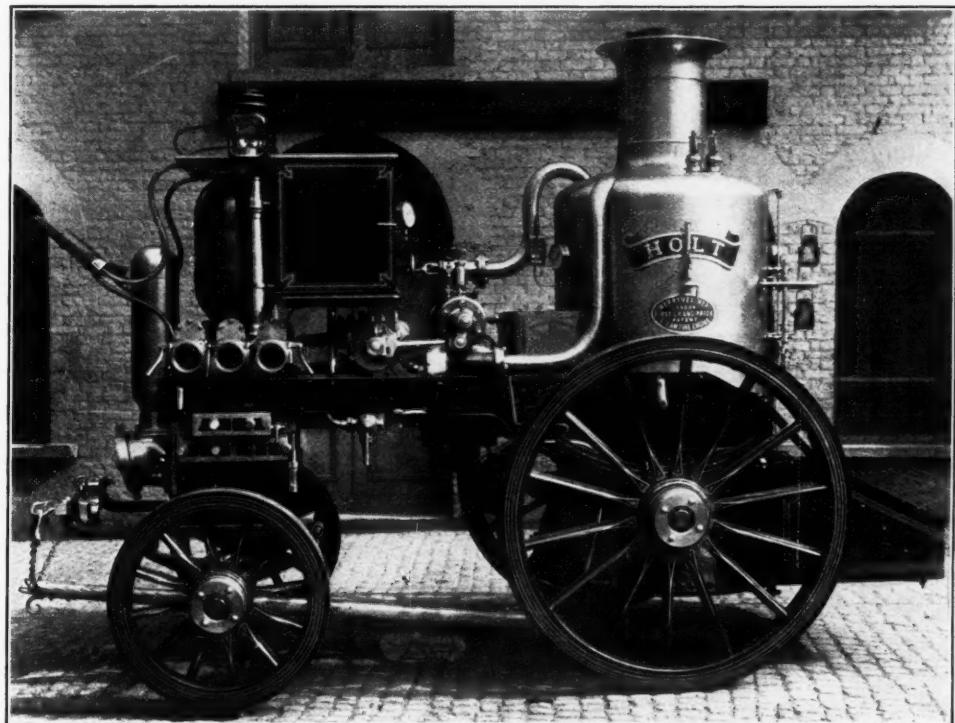
In case of a burst of hose, the foreman shall report as to the pressure at the time and cause of the rupture. Men with trumpets shall be stationed at the stream and along the line so as to receive and transmit the orders of the chief. Engineers of steamers shall not allow the steam pressure to exceed ninety pounds except under orders and if engines are not used at a fire for thirty days, the engines shall be tested and while standing in a house, the position of pistons in the cylinders shall be changed. Drivers are not permitted to race in going to or returning from fires and shall never

drive faster than is consistent with the safety of the apparatus and of the public. If it be necessary to drive over lines of hose, a report of the same must be made.

"6. The first hose carriage or wagon arriving at a plug shall have control of the water therefrom and the first engine arriving at said plug shall make attachment and give a stream to the company holding said plug, and said attachment shall have preference over any other attachment made from said engine during that fire.

"7. Any company running out a line of hose and not having a sufficiency to reach the fire shall be supplied by the next company arriving and the line completed, and the control of the completed line shall rest in the company making the first attachment. It is specially ordered that any company having the use of another company's hose at a fire shall return the same to the company owning the hose, cleaned and ready for service, as soon after the fire as the hose may be gotten into proper condition."

Any companies disobeying any order of the Chief shall be fined \$50 for the first offense and suspended without pay for the second. If any member of a company disobey any rule or regulation of the department, he shall be tried by a committee of five members of the department appointed by the mayor, and, upon conviction, shall be suspended for six months, a second offense meeting with expulsion.



LARGEST CAPACITY FIRE ENGINE IN THE WORLD

facility and the automobile pattern or installation of the special fire service water main system has been urged, but if an engine can be built with the lightness and great capacity of the one in service in Liverpool, the day of the steam fire engine will have been prolonged.

Recommends Salvage Corps

For twenty years the fire department has looked after the safety of the city of Winnipeg, Manitoba, and the present Chief, J. E. Buchanan, has been in charge four years. Chief Buchanan's report to the Council is very interesting, because it is out of the usual style of tabulation of figures. Chief Buchanan stated that the experience of the last two years has demonstrated that the apparatus with one large horse cannot hope to compete with those having two horses. The latter carry more hose and cover the ground much faster, facts which are of the greatest importance in a fire department. There is a great demand for more ladders as the only aerial truck having to respond to every fire and, if two fires occur at the same time, the department is handicapped. Another hose wagon is also needed. In consideration of the new stations that are to be erected for the outlying districts, the Chief suggests that they be large enough to house, some a hose wagon, chemical engine, ladders, etc., and other a steamer, hose wagon and chemical. The object of having a steamer

WHAT POLICE AND FIREMEN ARE DOING

New Alarm System for Montreal—Chemical Engines Grow in Favor—No False Alarms in Jersey City—To Re-organize London Brigade

Lynn Reports Small Fire Loss

THE fire department of Lynn, Mass., needs several additions in the estimation of Chief Charles H. Downing. One is a new steamer to take the place of one that has been in continuous service for thirty-seven years and is naturally not as powerful as the needs of the present demand. Another chemical engine is also recommended as the usefulness of this kind of apparatus has been demonstrated. There are already four chemicals in the department in addition to seven steamers, three trucks, an aerial ladder, seven hose wagons, a combination wagon, four two-horse hose reels, and eight fuel supply wagons. Outside of a few necessary repairs to apparatus and houses, the department is in good condition. During the past year there were answered 438 alarms, the total loss being \$1,524,354.08, and the net loss over all, \$32,401.02. The committee on fire department has endorsed the petition of the 169 men and officers for an increase.



Will Pay Call Men Regular Salaries

FOR some time a plan has been forming to increase the efficiency of the Wilkes-Barre, Pa., fire department. Chief J. G. Schuler and fire committee of the Council have presented a bill to the Council calling for a reduction of the call men from 105 to 80 and for the paying of salaries of \$60 a year to each man, irrespective of the number of fires they attend. Under the present system the twelve men with each hose or engine company, and the sixteen men connected with each hook and ladder truck are paid fifty cents an hour for every fire they attend. The proposed change will reduce the engine and hose companies to eight men and the truck companies to twelve men. While the new system will be but little more expensive than the old one, it will be more efficient in the opinion of the Chief and permit of better discipline in the department. Three extra paid men will be appointed to relieve the paid men now in the department and give them one day off in eight. At present 90 per cent. of the fires are extinguished by chemicals. Some of the new chemical engines saved their cost in the first two or three fires.



To Keep Police and Fire Department Out of Politics

MEMBERS of the police and fire departments of Wisconsin have been stirred up over an attempt to take the control of these departments from the civil service and place them in politics again. In 1897 the law establishing the police and fire departments in the cities of the second and third class was passed by the legislature after three years' efforts on the part of the chiefs of police of the State. Chief of Police H. B. Byrne of LaCrosse was instrumental in having the legislation pushed by the chiefs' association. The bill provided for the establishment of a police and fire civil service board to control these departments in the cities of the second and third class. The commission was to consist of four members, two from each political party, and the appointment of these members was placed in the hands of the mayor of the cities and the terms were for four years one to be appointed each year.

The result of this law has been most satisfactory, having taken these two departments entirely out of politics and providing for their greater efficiency. Any change, therefore, to the old methods of spoils system is calculated to arouse both citizens and members of the departments concerned and pressure is being brought to bear upon the members of the legislature to prevent any movement towards taking a backward step by passing a bill repealing the above law. A circular letter has been sent to chiefs of police about the State warning them of the contemplated action and urging them to protect themselves by interviewing their senators and assemblymen that no bill of this character might slip through at an unguarded moment.

Police Force Proves Efficient

DURING the past year Washington, D. C., has cause to congratulate itself upon the management of its police department. Major Richard Sylvester, Superintendent of Police, in submitting his report to the Commissioners, states that at no time has the police department been so free from criticism as during the past year. He urges an increase in the force to correspond with the growth of the city. Regarding the subject of crime, Major Sylvester states that the country at large has suffered more from depredations upon property than ever before. By far the greatest evil existed in the District, according to the Superintendent, is the pilfering by dishonest servants, clerks, etc. Thefts under this law, petty larceny, amounted to \$4,275, of which about one-third were punished. There were about twenty-nine charges of highway robbery, of which sixteen were proved. According to the laws of the District, it is illegal to hold public entertainments, for which tickets are sold and inducements held out to the public in the way of prizes to be played for; this prohibits public euchre parties. Every officer who joins the force in Washington must be schooled in target practice with the revolver, and tests are frequently held among the members of the force and medals awarded for proficiency with this fire arm. The Superintendent submitted a plan for giving the policemen eight hour tricks of duty, dividing the command into four platoons. The subject of motor vehicles occupies also a considerable portion of the report.



Paid Department for Atlantic City

THERE has been considerable discussion in Atlantic City, N. J., during the last two months concerning the advisability of installing a full paid fire department. City Electrician Farrand was quoted as saying that the only way to discontinue the ringing of the large bells on the towers of the fire department, a matter that is very annoying to the residents, was to establish a paid department. The fire committee of the Council recommended that such a department be formed and that the absolute command of all the men be placed in the hands of Chief Wiesenthal. Better discipline could be enforced with greater efficiency of the department. The Council did not act favorably on the recommendation at the time of its introduction, but an ordinance before the body calling for a paid department may receive favorable action later on in the year. Some members of the Council are not in favor of a paid department at present and wish to postpone any action looking toward that end.



United Effort to Stamp Out Plague

THE California State Board of Trade, The San Francisco Boards of Trade, Chamber of Commerce, the Merchants' Association, the Merchants' Exchange, the Manufacturers' and Producers' Association of California, and the California Promotion Committee have strongly urged the Governor and the Mayor and Supervisors of San Francisco to secure a prompt co-operation between the boards of health of the city and State and the United States Marine Hospital Service for the eradication of all danger from bubonic plague. A statement signed by Governor Pardee, Mayor Schmitz, Health Officer O'Brien of San Francisco, Surgeon General Glennan of the Marine Hospital Service and Dr. Gardiner representing the State Board of Health and the presidents of the trade organization mentioned presents the assurance that there is no longer any danger from the plague, inasmuch as complete harmony and co-operation exists between the various health and civic officers. Searching inspections will be pursued for an indefinite period to prevent any hidden cases of disease from escaping the notice of the health officers, and seven new inspectors have been appointed for the Chinese quarters.

Reorganization of London Fire Brigade

INSTEAD of resigning from the post of Chief Officer of the Metropolitan Fire Brigade of London, as was rumored, Captain Wells has proposed radical changes in the organization of the brigade. He asks that a chief officer be appointed to take charge of the city of London and to be second in command to Captain Wells. Three other officers are desired to act as assistant chiefs, more firemen, the immediate erection of the City fire station, and the construction of a new fireboat are wanted. Captain Wells desires that the new chief officer be selected from the navy and that he have his headquarters in a new building in the centre of the city. A large amount will be required to carry out all the plans proposed.

New System of Alarms in Montreal

A CONSULTATION has been held between Chief Benoit and other chiefs of the Montreal fire department and the fire alarm branch looking toward a new system of sounding alarms. It is proposed that in the future no second alarm can be given, except on receipt of tapping, previous to pulling the box, and the third alarm will be given in the same manner, the tap signals to be known only to the officers of the brigade.

During a big fire, the chief or sub-chiefs' drivers will remain in charge of the nearest fire alarm box, and should another fire break out, the number of the box will be tapped on the bell in the fire alarm box, and the man in charge of the box can report the alarm to the chief or one of the sub-chiefs. Two rounds will be struck for the first alarm, and one round for the second alarm. For the third alarm, instead of striking the number of the box once on the gong, six blows will be struck, and for a general alarm to call out all the department, three sixes will be the call.

Another matter is occupying the attention of Chief Benoit and that is the fitting out of the coal wagon of the department with a coffee urn to give the men a hot drink during cold weather. Alderman Nelson, a member of fire committee of the Council suggested it and the officers of the department have endorsed the project. Chief Benoit will report on the cost of the equipment. The New York firemen have been taken care of in this line by the Church Temperance Society which has fitted out two coffee vans for the firemen when on duty for several hours at winter fires. A description of these wagons was given in the May, 1902, issue of THE MUNICIPAL JOURNAL.

Wires Should Go Underground

ANOTHER chief of fire department urges the placing of all electric wires underground, especially in the business portions of the city. Fire Marshall A. R. Tendering of Peoria, Ill., in his report to the City Council for 1902, states that these wires form one of the greatest matters with which the department has to deal and which seriously interferes with its efficiency. It is impossible at times to raise the aerial ladder because of the wires. The department apparatus consists of seven two-horse hose wagons, a two-horse hose carriage, two combination hose and chemical engine fitted with fifty gallon tanks and one double eighty-gallon Champion chemical engine, a city truck and an aerial truck, a second size Ahren's steamer. In reserve are held two steamers, two hose carriages and a supply wagon. There are sixty-four men in the service but the Chief recommends that another be

appointed so that an ordinance lately passed by the Council providing for a week's vacation for each man may become operative. A new hook and ladder truck is needed at one end of the city, as at present this section is three miles from the nearest truck house. There were 366 alarms during the year attended with a total loss on buildings and contents of \$88,462. The department cost the city for maintenance, \$79,536.14, for which \$75,225 was appropriated and \$4,311.14 came from the insurance tax.

Use of Chemical Engines Growing

ANOTHER fire department shows that the use of chemicals in fighting fires at the start is coming to be the best method. In the report of Chief Harry L. Marston, of the Brockton, Mass., fire department, it is stated that 14,325 feet of chemical hose was laid as against only 24,000 feet of other hose, that 101 tanks were charged on chemical engines, 5,591 gallons of chemical, forty-two pony chemicals and 4 tubes of dry powder were used. There were 267 alarms and the loss was only \$32,140.55. The permanent force consists of thirty-five men,



TRUMBULL AVENUE POLICE STATION, DETROIT, MICH.

but should be increased at once in the opinion of the Chief, to keep pace with the growth of the city. The department has been kept busy inspecting premises to keep them clear of rubbish, etc., and this work has the good result that it keeps the men posted on the character of the buildings they are called upon at any moment to enter in case of fire. Chief Marston urges that more stations be erected or provided for by the purchase of lots and that certain fire districts be enlarged on account of the large number of shingle roofs that are responsible for the spread of many fires. A protective department should be instituted as soon as it would be of great value. The results from the use of rubber tires on some of the apparatus have been of such a character that the Chief recommends that all be similarly equipped at once. Signs should be erected giving the location of the nearest alarm box and provision should be made for the pensioning of all men injured in the service. Chief Marston acts also as Inspector of Wires and reports the necessity of placing all of the city wires underground and urges that all wires in the city should also be put in conduits. Additions are asked for in the alarm system including a new repeater and transmitter, a storage battery in place of the gravity battery now in use and the changing of the system to ten circuits instead of six as at present.

False Alarms Entirely Eliminated

WHILE the department is in good shape, Chief John Conway of the Jersey City, N. J., fire force has strongly urged that additional apparatus be purchased, that new companies be established and more men added to the force and that the alarm boxes be considerably increased in number. The report is the ninth of Chief Conway and the thirty-second of the department since its change from a volunteer force. It was only six years ago, however, since it has been full paid. The total force consists of 190 men and there are thirteen engine companies, six truck and three chemical engine companies, all fully equipped. The training school for the men was abandoned after its establishment in 1901 on account of lack of money. The department responded to 552 alarms during the year. False alarms have been stopped by the placing of jigger gongs on the poles over the alarm boxes. Promptness in responding to fires has been maintained by the placing of the keys in the boxes. The losses were \$389,598, a decrease of \$33,569 over the year preceding. Respecting the new apparatus recommended by the Chief, the following are essential in his opinion: two trucks, two combination hose wagons, and a new steamer. Two new trucks and one engine company should be added to the present force.

Meeting of Ohio Boards of Health

THE thirteenth annual conference of the boards of health of Ohio was held at Columbus on January 29 and 30. About two hundred physicians were in attendance. President Crossman stated in his

address that side by side with the wave of prosperity, went a tidal wave of infection that was enveloping civilization. Dr. W. S. Hart, Health Officer of Elyria, read a paper on "Regulation of the Barber Shop," which offered many suggestions to the health departments for the introduction of hygienic principles into these places. Were the shops clean there would be no diseases like barber's itch. Secretary Probst, of the State Board of Health, explained how the new code would affect the boards of health. The second meeting of the board was well attended. Mr. L. E. Chapin, of Canton, presented a paper on "Purification of Public Water Supplies" and offered many good suggestions. "A Review of the Law Governing Boards of Health" was read by Hon. Smith Bennett. Mr. A. G. Fuller, of Findlay, took up the subject of "Exercise of Police Power by Boards of Health," and he was followed by Dr. T. W. Rankin of Columbus on "The Importance of Pure Air and Sunshine in the Home." Dr. C. O. Probst, secretary of the State Board, took as his subject, "Neglected Opportunities of Boards of Health," speaking of the registration of births and deaths and the inspection of milk and water supplies.

A resolution was adopted at one of the sessions recommending to the State Board the adoption and enforcement of a rule requiring that screens be used to exclude flies and insects from rooms of patients sick with infectious diseases. The last session was given over to an illustrated lecture by Dr. W. T. Corlett, of Cleveland, on "The Clinical Aspect of the Present Epidemic of Smallpox, Compared with Previous Outbreaks."

FIRE AND POLICE PERSONALS

—Chief Littlefield, of Springfield, Mass., and assistant chief W. H. Daggett were re-elected by the fire commissioners.

—Mayor Mark M. Fagan, of Jersey City, N. J., has appointed Mr. John F. McNulty police commissioner for a term of three years.

—Chief W. M. Kellogg, of the Superior, Wis., fire department, who resigned not long since, has been succeeded by Olaf Johnson, who has been in the department since 1891.

—Chief of Police J. B. King, of Bamberg, S. C., was recently shot and killed by a man whom he was trying to arrest. As the Chief approached the house of the murderer, the latter shot him with a load of bird shot.

—Chief T. J. Maguire, of the Savannah, Ga., fire department, has been re-elected without opposition. The Chief is very popular and a demonstration was made by the firemen after the news of his election was made known.

—Chief Wiesenthal, of the Atlantic City fire department, was re-elected as the head of that department by the members of the different fire companies of the city. Charles Whippey and Charles Speidel were elected assistant chiefs.

—Chief of Police Patrick Hayes of Hoboken, N. J., was the recipient of a gold watch, presented to him by his friends among the officials. Mayor Lankering made the speech of presentation and presided at the banquet held in honor of the Chief.

—Ex-Chief Denis J. Swenie, of Chicago, died on February 16. He entered the volunteer fire department in 1849 and rose to be chief in 1858, when he organized the paid department. In 1879 he was created chief to succeed Matthias Benner. In 1901 he resigned. He was born in the city of Glasgow, Scotland, in 1834.

—William Pitt Tyler, Superintendent of the Police Department of Columbus, O., died January 17, at his home, after a lingering disease, followed by a stroke of paralysis from which he slowly declined. Chief Tyler succeeded O. M. Evans as superintendent of police in the summer of 1899, but had served in a similar capacity in Deadwood, Dakota, for three years.

—Col. George J. Harrison, of Lafayette, Ind., is said to be the only man who occupies the dual position of chief of police and chief of the fire department. Chief Harrison is a veteran of several wars, having fought under four or five flags. He was born in Troy, N. Y., in 1843. He witnessed the bombardment of Sebastopol

during the Crimean war and was in the expedition that went to the rescue of Lucknow, under General Havelock. During the Civil War he enlisted in Anderson's Zouaves and served also in several regiments of Pennsylvania. He rose to the position of captain and was breveted major on the field of action. He took part in the Fenian invasion of Canada, fought with Brazil against Argentine, but went over to the latter forces to take a command. He has served in responsible positions in several manufacturing firms of Lafayette and has been prominent in the Municipal League of Indiana.

—Chief Devine, of the Salt Lake City, Utah, fire department, has vigorously protested against a bill of Mayor Thompson permitting the arbitrary removal or appointment of members of the fire and police departments. While the mayor is theoretically at the head of these departments, the real heads are the chiefs, who are responsible for the work of the men. The Chief considers that it would be destructive of all discipline in either department if the mayor had the arbitrary power of removal or appointment without reason. Firemen and policemen should be encouraged to seek advancement on merit and not because of political "pull." Chief Devine said he would drop all effort to establish a pension fund were this bill enacted into a law. Under it, a chief or mayor could remove a man who had served long enough to be entitled to a pension and so prevent him enjoying the same.

—Nitric acid fumes caused the death of Chief James Foley, Captain Andrew J. White and Privates Thomas A. Droney and Edward Hogan, of the Milwaukee, Wis., fire department. The firemen were called upon to assist in preventing acid from a broken carboy from destroying goods in a factory. After fighting their way through the dense fumes of the acid, the men were able to throw sawdust on it and prevented this from burning by means of a stream from the chemical engine. All of the men were affected by the fumes, but only four died from its effects. It was some hours after the fire that the men began to feel sick and all efforts to save them were in vain. The City Council passed a resolution of regret and a public funeral was given the men, a large number following the bodies to the grave. A number of Chicago firemen and chiefs from other cities and towns were present. Senior Assistant Chief Herman Meminger was appointed chief of the department. Chief Meminger has been in the department since 1874 and served as Assistant Chief since 1901.

LITERATURE ON MUNICIPAL TOPICS

Reviews of Some Important Books—What the Magazines and Reviews Have to Say About Civic Affairs—Municipal Reports Received

Books

The fifty-fifth year issue of *Who's Who* is larger than ever before and its size has so increased that the publishers have found it necessary to omit the tables appearing in past editions to make way for the biographies. It is their intention, however, to issue the various tables in a subsequent separate edition. There are over 1,500 pages in the present edition and if further biographies are added, it seems probable that two volumes must be made of subsequent editions. While the majority of the personages mentioned are of English residence, a few prominent persons from America and the colonies are included. Copies may be secured through THE MUNICIPAL JOURNAL at the publisher's price of \$1.50 net.

Every branch of engineering work has its subdivisions and specialties and whole volumes are devoted to each specialty where once but a paragraph was given to it. Thus *Engineering for Land Drainage* by Charles G. Elliott, C. E., is intended for those who are engaged in planning and carrying out drainage improvements. Much must be left to experience that cannot be learned in text books, but the experience of engineers can be studied and much time saved and mistakes avoided by so doing. Therefore, a book dealing with matters in which the author has had practical experience, is of the greatest value to others who would take up that line of work. This work is short—232 pages—but the information has been put in a concise form for the busy man and the author has adapted accurate and systematic methods to the problems presented in land drainage. Practical and simple methods have been preferred to theoretical and complicated ones and the cuts, diagrams and tables have been selected to further simplify and illustrate the text. The subjects taken up in the various chapters are: soils, land drainage practice, levelling and topography, laying out drains in the field, fixing the grade of drains, maps and records, grading ditches for tile, flow of water through pipes, size of lateral drains, open drains, drainage of barnyards, cattle-lanes, etc., road drainage, drainage districts, estimates of cost and the benefits arising from land drainage. Published by John Wiley & Sons, New York, N. Y. Price, cloth, 12mo, \$1.50 net.

Many engineers in charge of municipal or of plants supplying public service are selected not so much for their technical as for their practical knowledge of the plant of which they are to have control. As the demands for power increase, it is found necessary to enlarge the plant by the addition of new machinery and a consulting engineer must be employed to advise concerning the smallest detail of the work necessary. A careful study of *Steam Power Plants* by Henry C. Meyer, Jr., M. E., would place the men in a position to decide themselves what machinery was necessary and how it should be installed. It is for that class of workers that this book is especially useful, although expert engineers will find presented in a convenient form data of use in the practice of their profession. A number of plates are given showing the plans of power stations installed in prominent places and detail sections of the machinery. Tables of importance are also included. The topics taken up in chapters are as follows: design of steam power plant, proportioning steam boilers, design of tubular boilers and boiler specifications, selection of engines, specifications for steam engines, steam and water piping, condensers, feed water heaters and economizers, mechanical draft, chimneys, coal handling, water supply and purification. Published in cloth, 8vo, and can be secured through THE MUNICIPAL JOURNAL at the publisher's price of \$2.

CITY engineers and surveyors will be interested in knowing that a practical book on *Surveying* has been put upon the market under the

authorship of John Whitelaw, Jr., As. M. Inst. C. E. The author claims that many of the works on surveying pay too much attention to the elementary portion of the subject and ignore the actual practical work of this science. To remedy this he has compiled a work of some five hundred pages. He has divided the subjects into twelve chapters, as follows: Chapter I, "Surveying with the chain only"; Chapter II, "Surveying with the aid of angular instruments"; Chapter III, "Leveling"; Chapter IV, "Adjustment of instruments"; Chapter V, "Railway and road surveys"; Chapter VI, "Tacheometry or stadia surveying"; Chapter VII, "Tunnel lining and setting out"; Chapter VIII, "Surveys for water supply works"; Chapter IX, "Hydrographical or marine surveying"; Chapter X, "Astronomical observations used in surveying"; Chapter XI, "Surveys in jungles, dense forests and unmapped open country"; Chapter XII, "Trigonometrical or geodetic surveys." The appendix to chapter ten explains the astronomical terms given in that division. There are any number of figures and illustrations used in surveying and there are a number of tables which would prove invaluable to a man in the field. Examples of surveying taken from actual practice lends additional value to the work. Published by D. Van Nostrand Co., New York, N. Y. Price, cloth, \$4.00.

Roads and Pavements, by Ira Osborn Baker, a portion of which is used elsewhere in this issue, forms another contribution to the number of books dealing with the construction of country roads and city pavements. Inasmuch as, on some subjects, engineering opinion is not one, the author has taken care to give the conflicting views with the reasons stated for each. Dirt roads form more than ninety-five per cent. of all roads and the author has consequently given considerable space to subject of their construction and maintenance. While the roads in some foreign countries are better cared for than those in the United States, the author holds that the principles of construction employed here are equal to the best, although there is considerable room for improvement even here.

The arrangement of the work will commend itself to those who desire to use it as a reference book, as the matter has been divided into parts, chapters, articles and sections, the last being graded according to their importance by black-faced type or italics.

There are two parts, viz: "Country Roads" and "Street Pavements." There are twenty chapters labeled as follows: "Road Economics," "Road Location," "Earth Roads," "Gravel Roads," "Broken Stone Roads," "Miscellaneous Roads," "Equestrian Roads and Horse-race Tracks," "Pavement Economics," "Street Design," "Street Drainage," "Curbs and Gutters," "Pavement Foundations," "Asphalt Pavements," "Brick Pavements," "Cobble-stone Pavements," "Wood-Block Pavements," "Comparison of Pavements," "Sidewalks," and "Bicycle Paths and Race Tracks."

The publishers are John Wiley & Sons, New York, cloth, 655 pages, \$5.

Periodicals

The issue of the *Architectural Record* for January contains an article by J. Schopfer on *The Furnishing of a City*. New York, N. Y.

Referendum and Initiative in City Government forms the subject for an article by J. R. Commons in the December issue of the *Political Science Quarterly*. Boston, Mass.

G. Frascara contributes *Municipalization of Public Services* to the December 1 issue of the *Nuova Antologia*. Rome, Italy.

The January issue of the *World's Work* has an article by F. A. Ogg on *Proportion of Population, City and Country*. New York, N. Y. Price per year \$3; per number 25 cents.

The Cosmopolitan for January contains an article by Congressman W. P. Brownlow on *National Aid to Road Improvements*. Irvington, N. Y. Price 10 cents per copy; \$1 per year.

Some Taxation Problems and Reforms forms the subject of an interesting article in the *Review of Reviews* for February by John R. Commons, secretary, Taxation Department, National Civic Federation. To Indiana he gives credit for marked progress in certain methods of taxation for the last decade. He outlines the powers of the Indiana commission and shows the improvements made on the local assessment system. He takes up the working of the tax system in Michigan and Ohio's attempts to tax public service corporations. Tax reform in Wisconsin and Minnesota are mentioned, and the author speaks in general of the difficulties of assessing bank deposits, the question of mortgage taxation showing how this tax is dodged. Brief mention is made of the exemption law of Indiana and the revolutionary legislation in Chicago. Regarding St. Paul's plan of block taxation, he says that publicity has been carried to its highest perfection. Full valuation in New York city is treated at considerable length. New York, N. Y. Price per year \$2.50; per copy 25 cents.

The Good Roads Magazine for February has a number of good articles on the improvement of roads. Supervisor Ira P. Cribb tells of the improvement of roads in Canandaigua, N. Y. *Construction of Sand-Clay Roads* tells how to make good roads in localities where sand and clay abound. W. L. Spoon of the Office of Public Road Inquiries contributed the material for the article. New York, N. Y. Price per year, \$1; per copy, 10 cents.

The Proceedings of the fourth annual good roads convention of the Board of Supervisors of New York State, held at Albany, January 20 and 21, 1903, has been issued by the State Engineer, Edward A. Bond. It tells of the work that has been done in the interests of good roads throughout the State and is well illustrated by cuts that show the before and after of stretches of road that have been improved.

The Law Relating to Nuisances in the Metropolis is the subject of an article in *The Sanitary Record* for February 5, by J. F. R. Stephens. This is the first consignment of a series of articles on this subject dealing with nuisances and how they are controlled by law in London. London, Eng. Price per week, 3 pence.

Electric Enterprise in Greater London forms the leading article of the January 30 issue of *The Municipal Journal*. This reviews what the various boroughs of London are doing in the line of railways and lighting, and shows wonderful progress made in this direction. The issue for February 6 has an article devoted to *Lancaster Tramways*, describing the system partly opened by the city. The new town hall of East Ham is also described and illustrated. A special correspondent discusses *London's Educational Problem*. Numerous items of what is going on in English municipalities enable one interested to keep in touch with municipal matters in England. Anyone interested in municipal matters in a country in which they have progressed much farther than in America, should read *The Municipal Journal* so as to profit by the experience of England. London, Eng. Price per week, 1 penny.

The issue of January 30 of *The Surveyor* is a special number and contains a review of municipal engineering for 1902 in all branches of the work. In addition there is an article on the *Dover Corporation Turkish Baths* with several plates showing different elevations of the buildings. *Legal Precedents for 1902 in Relation to Municipal Engineering* is contributed by J. B. R. Conder. The balance of the magazine is devoted to the work projected for 1903 by local authorities.

The issue of *The Surveyor* for February 6, 1903, contains the minutes of the meeting of the Association of Municipal and County Engineers of England and copies of some of the papers presented. T. Caink, City Engineer of Worcester, Eng., read a paper on *Sewer Ventilation*. The author presented a design for a manhole cover which, while complicated, he claimed would prevent foul air from

escaping while allowing sufficient ventilation to prevent undue pressure. R. Read, C. E., City Surveyor of Gloucester, presented a paper on *The Ventilation of Sewers and Drains*. He took up the different methods of ventilation in use and explained what happened to the air of the sewer when under different conditions. If the sewage had a flow of three feet per second, there would be no putrefaction and so no foul gas inasmuch as it would reach the outfall before this could take place, but the alternate wettings of the sides of the sewer due to rise and fall of the flow, the decomposed discharge from house drains and the want of proper ventilation gave rise to offensive odors that had to be taken care of. The author desired to try the experiment of doing away with the interceptor trap on all drains that are outside of the houses. This would allow of a better gradient and he says no harm would come to the household. Deputy City Engineer of Bristol, N. J. Steele, C. E., contributed a paper on *Ventilation of Sewers*. He considered that the experiments made in towns were incomplete and thought, that if any principle could be laid down, it should be done by a commission of physicians and engineers to experiment throughout the United Kingdom. He closed his paper with the questions, (1) is it necessary to admit atmospheric air to a properly constructed sewer system at all times, and, if so, how? Is it necessary to continuously provide a vent for the air displaced from a good sewer system by various causes, and, if so, how? London, Eng. Price per week, 3 pence.

THE sixth volume of the papers delivered before the American Park and Outdoor Art Association contains the addresses before the Association at its meeting in Boston, Mass., last August. All but one of the papers appear in full and are, as the association considers them, "valuable additions to the literature of outdoor art." The titles and authors of the papers delivered are as follows: "Popular Utilization of Public Reservation," by Dr. Charles W. Eliot; "The Influence of Beautiful Surroundings on Children," by Rev. J. N. Hallock, D. D.; "State Forest Reservations," by Mira Lloyd Dock; "Water an Effective Factor in Municipal Art," by Albert Kelsey; "Civic Improvement Work," by Hon. John DeWitt Warner; "The Forward Movement in Harrisburg," by J. McFarland; "Public Beauty and Good City Government," by Clinton Rogers Woodruff.

Municipal Reports Received

Since last issue we have received the following reports and messages:

Annual message of Mayor Charles H. Gaus, of Albany, N. Y.

Plumbing regulations of the city of Norfolk, Va., compiled by H. N. Poulson and R. E. Steed.

Annual message of Hon. Charles S. Baxter, Mayor of Medford, Mass.

Proceedings of the tenth annual convention of the Pacific Coast Association of Fire Chiefs, Victoria, B. C., 1902.

Report of the second annual convention of the Union of Canadian Municipalities held at Montreal in September, 1902.

Annual reports of the Department of Public Works, Rochester, N. Y., for 1901, with the compliments of City Engineer E. A. Fisher.

Fire marshall's report of Peoria, Ill., for 1902, sent us by Marshall A. R. Tendering.

Annual report of the fire department of Brockton, Mass., for 1902, with the compliments of Chief Harry L. Marston.

Report of City Controller James E. Pillsbury, of Peoria, Ill., for the year 1902.

The annual report of the City Electrical Department of Cambridge, Mass., for 1902, sent us by Mr. Charles F. Hopewell, who occupies the positions of Inspector of Wires, Superintendent of Lamps and Acting City Electrician.

Annual report of the Board of Police, for the city of Fall River, Mass., for 1902.

Report of the Commissioners of the Israel Putnam, Memorial Camp Ground to the Governor of Connecticut, sent us with the compliments of Commissioner G. A. Parker, Hartford, Conn.

The Building Code containing the laws, ordinances and regulations of Albany, N. Y., with the compliments of Mr. Lewis J. Miller, clerk of the fire department.

REVIEW OF MUNICIPAL REPORTS

Steam Roller and Ditch Machine Needed in Houston—Allentown Finds Street Sweepers Profitable—Meters to the Rescue of Cambridge Water Supply

Machines Make Street Cleaning Easy

THE streets of the city of Allentown, Pa., are not as clean as Mayor James L. Schaadt would like to see them, but with the facilities at hand, they are as clean as can be expected. Two Menzies street cleaners are in use and the asphalted streets have been kept clean by their aid. The city should have a two horsed cleaner and at least two more of the Menzies hand cleaners when the streets could be kept in a state of cleanliness with ease. The purchase of a ten-ton steam road roller has been of the greatest assistance in keeping the macadamized roads in repair. The use of trap rock in place of crushed lime stone is recommended as being more lasting, although costing more at first. The erection of street signs at all corners is recommended by the Mayor. City Engineer J. Howard Martz, in his report to the Mayor, speaks of the use of material taken from a macadam street, when the same is being repaved with brick or asphalt, and used in repairing other streets, thus saving in cost and serving to keep the other street in better repair. The abolition of all gutter crossings has been accomplished and he urges that a house sewerage system be built as one of the greatest needs of the city.



Better System of Water Works Needed

MR. M. K. BISHOP, Supt. of Public Works, said, in his report for 1901, "if the Commission were not handicapped by a broken-down system of water works, they would be able to give to the tax-payers a great many more modern improvements." He took a gloomy view of things and claimed that Hudson stands still "or moves backward" while other cities near-by are progressing. The expense for the maintenance of the water system increased considerably while that for the streets has remained about the same as for the preceding year. \$14,372.78 were expended on streets and \$13,880.63 on water works. The Superintendent considered that the city was in great danger from fire and public health and he made an urgent appeal for better and more abundant water supply. The per capita consumption of water is entirely too large for the city, being 151.7. The only remedy in the opinion of the Superintendent to stop the waste of water and increased consumption of coal in the pumping stations, is the installation of meters. Not only would less pumping be necessary, but mains that are not now adequate to supply the proper pressure would become so. He made some exhaustive tests with meters to demonstrate to his own satisfaction that 50 per cent. of the water pumped is wasted and he gave in full the result of his investigations. During the past year, the prices for macadam ranged from 41 1/4 cents to 65 1/2, the average being a little over 12 cents. By doing their own work from 3 to 4 cents per yard has been saved over the contract prices.



Reasons for Defect in Asphalt Pavements

THE conditions of the filter beds at the disposal plant of Houston, Tex., are not what they should be according to City Engineer F. L. Dormant. The coke strainers consist of eight inches of coke on six inches of broken stone laid on vitrified pipe, the joints of which are wrapped with muslin. Many holes have appeared in the sand beds showing that the sand has been washed into the pipes. On account of the absence of detritus tanks, the coke beds are being badly clogged and the City Engineer recommends that such tanks be installed. He also recommends that the sanitary sewers and storm sewers be rigidly separated, that sanitary and storm sewers be placed in all streets before they are paved, that a building ordinance be passed defining the thickness of walls, fire-proof construction, etc., and the establishment of a fee for building permits in proportion to the cost of the buildings. The city should purchase a steam road roller of ten tons weight and a ditch machine to use in cleaning and

digging ditches. In one year enough could be saved by these machines to pay for themselves.

The asphalt pavements have not stood climatic conditions well, due according to the City Engineer, to the fact that they were laid in the winter time and because of the expansion of the concrete base. From the experience Houston has had with this class of pavement, the life of a street paved with asphalt is from twelve to fifteen years before relaying and should not cost more than 6 cents a square yard for maintenance after a five year guarantee. The defects in asphalt in Houston are being caused by standing traffic, water standing in gutters and depressions, escape of illuminating gas, oil dripping from kerosene wagons, and excessive sprinkling. Repairs should be made quickly, but should not be done in bad weather. The present contracts call for a guarantee of ten years with a reserve of 20 per cent., one-fifth of which is to be paid each year, five years from the completion of the work.

Three years before the first asphalt was laid in Houston, the first brick paving was put down. In the opinion of the City Engineer, the best foundation for brick is a six-inch concrete base with two inches of clean, sharp sand. In one instance a gravel foundation gave excellent results due to thorough rolling and sprinkling. The best filler is of two parts Portland cement and one part of sand with enough water to make a thin grout. A long time guarantee is not necessary for brick pavements, nine months being recommended.

Meters Must Be Adopted to Save Water Supply

IN reporting on the operation of the water department of Cambridge, Mass., the Water Board calls attention to the increased consumption which is rapidly encroaching on the sources of supply and will necessitate soon radical measures to increase said supply unless means are taken to lessen the waste of water in the city. Both methods must be done eventually but the latter necessarily comes first. The Metropolitan Water Board has recommended the use of meters in order to check unnecessary consumption and Cambridge should take warning and do the same. During the last year a separate canvas of 812 meters was taken with the result that the per capita consumption used for domestic purposes was only 35.87. The total per capita consumption for the city was 85.27. "These figures indicate plainly enough * * * that the use of meters greatly decreases the waste of water." The Board obtained similar information from many other cities with which it corresponded. In the message of Governor Crane in 1902, appears a paragraph stating that the use of meters has been tried by municipalities with beneficial effect. The Board reiterates its previous statements made during the year that the excessive waste of water hastens the time when greater expenditures must be incurred for new pipe lines and aqueducts. "The longer time this can be postponed, the more saving can be made in expense." By means of a complete meter system the laying of a new main pipe line can be put off five years and the interest and sinking fund payments for five years upon the bonds for such pipe, less the interest on bonds for the meters, would be saved the city.

The city has in use 2,113 meters and about 8,000 more would be needed to fully equip the city. The Board, therefore, unanimously recommended the expenditure of the sum of \$25,000 to start the installation of a complete meter system. If this matter is not provided for by the Council, the Board recommended that a new pipe line be laid from Stony Brook to Fresh Pond. About two years will be consumed in this work.

The Board recommended the abolition of the annual rental charge of \$2 for meters, thereby making the minimum charge for metered water \$5. The total cost of the works up to 1902 was \$5,724,301.60. The net water debt amounts to \$2,442,964.02 and the net revenue for the year amounted to \$2,171.54.

THE RENO INCLINED ELEVATOR

Has Carried Ten Million Passengers Without Accident—Adapted to All Public Buildings, Elevated and Underground Railways

THE transportation problem as related to the larger cities of America is rapidly assuming a serious aspect. New York, Chicago, and Boston have been forced to the construction of elevated roads, and New York and Boston to the construction of subways in addition, besides Chicago has plans for subways under consideration. This furnishes transportation on three levels, one above, the other below the street, but the usefulness of the elevated and subway is greatly marred by the fact that passengers are obliged to climb stairs. This, to most people, is very objectionable, and in the cities where the elevated has been in use for a number of years it has been found to affect the traffic. Of course where the traffic is so great that the surface lines are inadequate to the demand the elevated roads are used freely. The ever inventive Yankee has come to the rescue and provided a means whereby this objection is overcome.

The "Reno Inclined Elevator" is the instrument by which this objection is removed. This elevator has been installed at the Fifty-ninth Street and Third Avenue, Manhattan Elevated Railroad Station, New York, and two have been in operation for some time at the Marshall Boulevard station of the Metropolitan West Side Elevated Railroad of Chicago. A great many of these elevators have been installed in department stores throughout the country and in public amusement places and thoroughfares at home and abroad. The duplex elevator, made by the Reno Inclined Elevator Company, of New York City, is especially adapted to afford comfort to all who are obliged to frequent or visit Municipal Government offices, especially in large cities.

The present method of conveying people from one level to another, by means of a vertical elevator, has many objections. During the busy parts of the day there is always overcrowding and tiresome waits, at a time when it is most undesirable. The fatigue incident to traversing the streets of a city, on business or shopping tours, by either men or women, can be largely reduced if this conveyance were installed at all the elevated and subway stations, particularly in New York.

With the use of these elevators there can be no overcrowding. There will be no necessity for waiting as the elevator is always in motion, and there are no disagreeable sensations caused by its use, as in the case of the vertical elevator. No exertion whatever is required in going from one level to another. The passenger steps on the moving incline, resting his hand on the moving hand rail and is carried to the upper or lower floor at a moderate rate of speed. The value of such a device as this cannot be over estimated in ex-

pediting the handling of many thousands of passengers of the elevated and subway systems. It is a question which should be carefully investigated by the authorities of all of our large cities.

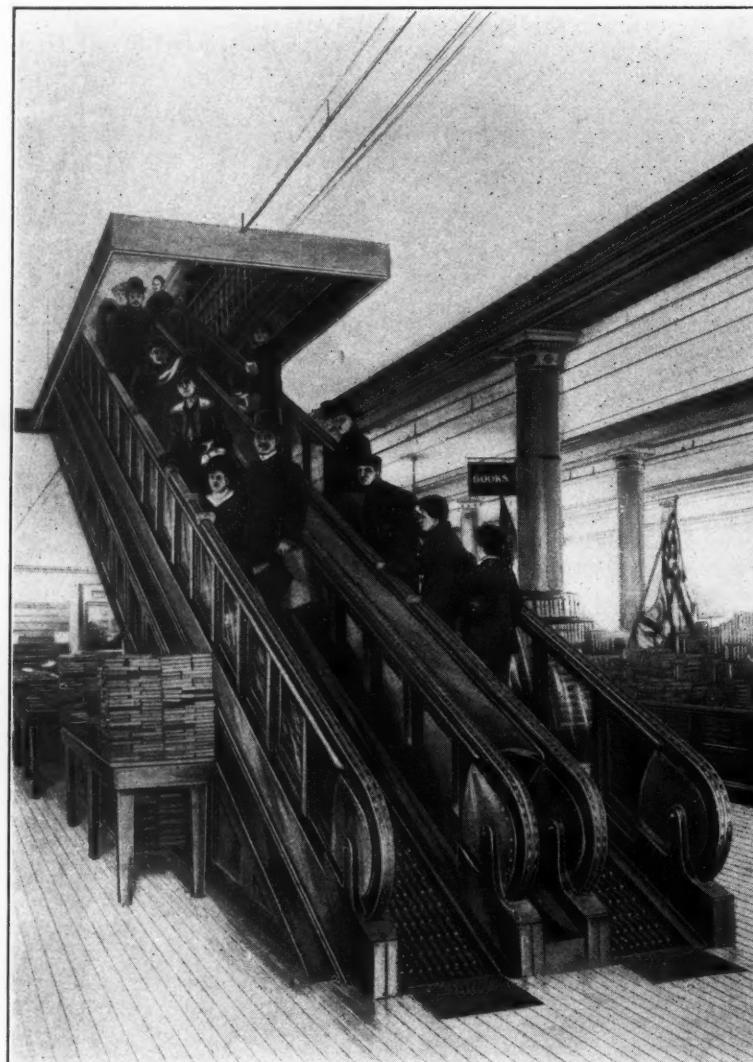
A description of some of the points of construction will not be without interest. The elevator, when intended for single file service, is $3\frac{1}{2}$ feet in width; for double service, 5 feet, and is built at an angle of 25 degrees. The structure consists of steel frame work, bolted at the top to the steel floor beam or header, and similarly supported at the bottom. Near the middle it is supported by a steel column, the weight at that point being about 2,100 pounds. The moving incline consists of a series of hard wood slats or treads of a special form, attached to an endless chain, rotated by a sprocket wheel. These slats have fastened to them a series of rubber covered longitudinal ridges, each being three-quarters of an inch in width and one inch high. These serve as a comfortable footing for the passengers and also insure a practically smooth and safe landing at the upper end of the machine.

The landing is accomplished in the following manner: The feet of the passenger, which rests upon these rubber-covered ridges, are slid off as they arrive upon a comb-shaped landing consisting of cast-iron prongs, which fit into the grooves separating the ridges. The landing is a most agreeable and natural one, and forms a very essential portion of the machine. So perfect, in fact, is this action, that cotton waste will not catch at this point. To each end of the wooden slats is attached a small anti-friction wheel of Hematite. These roll upon angle-iron tracks on both their upward and downward passages, and insure easy and noiseless running.

The endless tread chain, besides passing over the sprocket wheel at the upper end of the machine, also passes over an idler sprocket wheel at the lower end. At-

tached to the shaft of the upper wheels is a direct connecting electric motor. The speed of the motor, 550 r. p. m., is thus reduced to about 14 r. p. m., at the driving sprocket, which gives the moving incline a speed of 90 feet per minute.

In order to steady the passenger in his ascent and descent on the machine, a moving hand rail is provided. This consists of an endless steel chain of special construction, which slides in a groove in a steel bar running from one end of the machine to the other. At the upper and lower ends of the machine the moving hand rail passes around sprocket wheels, enclosed in ornamental iron castings, thus making them invisible. The chain, after passing around these sprocket wheels, also passes over a third sprocket wheel on the main



THE RENO INCLINED ELEVATOR IN A DEPARTMENT STORE

shaft of the machine, which thus drives the hand rail at the same rate of speed as the moving platform. The hand-rail chain is covered by flexible rubber covering, which presents a comfortable surface for passengers to grasp. The operation of the machine is so noiseless that white spots are moulded in the rubber rail, to call attention to its motion.

The Fighting Asphalt Trust

THE following communication has been received from the Federal Asphalt Company, of Chicago:

"The 'Trust' has in its employ, for this purpose, a corps of skilled experts, past masters in the art of 'Municipal' deception, and they have accomplished in some instances a show of temporary success by methods involving gross misrepresentation, if not even more sinister influences than that. But 'Truth is mighty and will prevail.'

"The Trust says that the Federal Asphalt Company never laid a pavement that is two years old. But have the Trust Companies, the Barber Company, The Western, and others, ever made a pavement even one year old, under the present control of the receiver? There is no identity between the efficient Barber Asphalt Company of a few years ago and the present company, controlled by the court through a receiver, under the same name but a different company in all essentials. They may say in reply, that the Receiver's agents use the same material as the old Barber Company, which may or may not be true; but certain it is, that the quality of the pavement is more essential than the identity of the company, and the fact that the Federal Asphalt Company is new and has only been in the business a few months is entirely consistent with the greater fact, that its pavement, composed of absolutely pure asphalt and pure sand, made by nature into the eternal rocks, has endured traffic for ages, and the world over has been found more enduring by far than any pitch mixture. In Berlin, with fifty years of endurance, its natural asphalt rock streets are good.

"In other European cities, similar records are found and it will be so everywhere in American cities in due course of time. The California cities have had the same glad experience for over twenty years; central cities, like Columbus, Indianapolis, Louisville, and Buffalo, for from ten to thirteen years.

"It is the enduring quality of the natural asphalt rock that counts and will gain in esteem with increasing knowledge until the time will soon come, that pitch mixtures for asphalt pavements, with their short lives, will not be tolerated in American cities any more than they are in European cities.

"Potch asphalt advocates say, that there are no good pavements made wholly of pure Kentucky asphalt rock and by constant and persistent reiteration they seem to create doubt in some minds. Where the natural rock is very low in asphalt it is no injury to add some other asphalt to bring the percentage up to the required per cent., and with several deposits that have been worked, this has been done with good results, but the mines of the Federal Company are so rich in asphalt that such addition is unnecessary and pavements from these deposits without any added asphalt whatever have been made in several cities including Columbus and Buffalo. These pavements are from seven to fourteen years old and have always been the finest in the world, not a sign of wear, not any disintegration, never a crack or a hole, no maintenance expense—they are ideal pavements. The identical formula, the exact duplicate material of these splendid pavements, the Federal Company supplies to contractors in all cities that will adopt proper specifications. These beautiful, enduring, economic pavements, any city can have at less cost than the pitch mixtures with their universal failures.

"We are gravely told that Kentucky Rock should have imported rock or Trinidad asphalt added to make it have the 'correct' amount of 'bitumen.' There was recently a company laying Kentucky rock that tried to follow specifications of the Trust kind and to increase the per cent. of 'bitumen' and petroleum oil was added, like the pitch mixtures, and sure enough, this pavement was worthless like the pitch mixtures.

"'You must add more bitumen and some limestone dust,' say the Trust experts, 'so as to imitate our standard formula.' Well gentlemen, we answer, as you never did make a mixture that would endure

traffic without going to pieces, you have always failed, then why, in Heaven's name, should your advice be taken in trying to improve upon nature's plan? The fact is, that the federal asphalt pavement, even if it should be as low in asphalt as your 'paid experts' state it is, would then be richer in real asphalt than your pitch mixtures. You play upon the credulity of the public by using the word 'bitumen,' as though it was the same as the word 'asphalt,' when from one-third to one-half of your 'bitumen' is only 'petroleum oil,' an ingredient truly 'bituminous' but actually injurious to the pavement. You dare not put the true word 'asphalt' in your specifications in place of the misleading word 'bitumen.' Is not all 'asphalt' 'bitumen?' Yes, but all 'bitumen' is not 'asphalt.'

"Our federal asphalt rock pavement always contains more real genuine asphalt than the pitch mixtures by from one-eighth to one-third.

"The Trust says our federal rock asphalt will not last and they will quote formulas for artificial mixing, gotten up by their paid agents. Now, laying aside prejudice and bigotry and partisanship; what or how can a natural rock street deteriorate? It is nothing but asphalt and silica. Asphalt, the only unchangeable mastic known in the world, remains pliable and unaffected for thousands of years as shown by 'mummy cloths,' good as new, yet 4,000 years old. Silica will not change or be affected by water, climate, or other exposure. No, a genuine asphalt rock pavement is good once and always. No one ever saw a crack in such a street, nor any other sign of disintegration.

"Where the Trust can find one yard of imperfect asphalt rock pavement we will agree to furnish a thousand yards of worse pitch mixture pavements. They are the common occurrence of pitch pavements while it is truly a rare thing to find any defect in any genuine asphalt rock street."

New Catalogues Received

—The Buffalo-Pitts Manufacturing Co., of Buffalo, N. Y., has recently issued a handsome new catalogue descriptive of its road rollers and other apparatus employed in the construction of streets and roadways.

—The Toledo Foundry and Machine Co., of Toledo, O., has recently issued a 96-page illustrated catalogue telling all about its steam shovels, dredges, and ditchers, hoisting gear, centrifugal sand pumps, etc., etc.

—The Plunger Elevator Co., of Worcester, Mass., has recently published a handsome little brochure, beautifully illustrated and gotten up by Lillibrige of New York. It contains a very comprehensive and lucid description of the "Plunger" elevator, and can be had on request.

—The D'Olier Engineering Co., of Philadelphia, in its bulletin, Series T, No. 2, for January, 1903, describes its direct current steam turbine dynamos.

—The Pacific Flush Tank Co., of Chicago, Ill., has just published Advance Catalogue No. 8, describing siphonic apparatus for bacterial sewage filters. This concern also manufactures the well-known Miller Automatic Flush Tanks.

—The Farrel & Bacon ore and rock crushing machinery is well described in a 62-page catalogue, with cover, which is profusely illustrated, and contains much valuable information about the operation of these plants, which have been installed in various parts of the world. A request sent to Mr. Earle C. Bacon, Engineer, Havermeyer Building, N. Y., will secure a catalogue.

—The latest catalogue of the Art Metal Construction Co., Jamestown, N. Y., descriptive of metallic filing devices, fixtures and furniture designed for public or private use, has been laid on the editor's table. It is folio size, printed in colors, profusely illustrated, charmingly gotten up and altogether a work of art. Those who contemplate making additions to their department or office furnishings will act wisely by securing a copy of this catalogue before purchasing.

—The Pacific Flush Tank Company, of Chicago, has just issued a handsomely illustrated catalogue telling all about its intermittent flush tanks.

A Paving Block Which Stands the Test

THERE are many manufacturers of paving brick and block in the United States, but none make a better quality than that manufactured by the Metropolitan Brick Company of Canton, Ohio. The accompanying illustration shows a street in Toledo which was paved with Metropolitan block in 1897. The brick was laid on a concrete foundation and a cement filler was used. The pavement is subject to heavy traffic, but after six years' wear it is apparently as good as new.

The manufacturer of this brick has shipped altogether, since the Company commenced business in 1889, 14,000 car loads, aggregating about 80,000,000 of brick. The company expects during the present year to increase this amount to over 100,000,000. More than 25 miles of streets have been paved with the various kinds of brick manufactured by this company. It recently filled an order for 200 car loads of brick to be sent to Merida, Yucatan.



STREET IN TOLEDO PAVED WITH METROPOLITAN BLOCK, 1897

City Engineer Jones, of Geneva, N. Y., made what he considers an improvement in the N. B. M. A. methods for testing paving brick. Mr. Jones has tested the brick of a large number of manufacturers throughout the United States with the following results:

Area of One Brick inches.	Number of brick re- quired to lay square yard pave- ment.	Weight, one brick in pounds.	Weight of square yard of pavement.	Percentage of loss during test.	Loss in pounds per square yard of pavement.	Increased loss in pounds over Met- ropolitan Block.	Per cent. of increas- ed loss per square yard of pavement over Metropolitan Block.
Metropolitan Rep's'd Bl'k	29.75	4.20	9.98	419.06	2.50	10.47	00.00
Nelsonville Rep's'd Block	29.65	42.2	9.50	400.90	3.20	12.83	2.36
Mack Lug Rep's'd Block	28.13	44.9	9.11	404.48	3.99	16.13	5.66
Mack Repressed Brick	20.78	60.2	6.88	414.17	3.90	16.15	5.68
Corning Repressed Brick	20.62	60.0	6.40	384.00	4.28	16.42	5.95
Townsend Rep's'd Block	27.00	46.3	8.60	398.18	4.17	16.60	6.13
Johnsonburg Rep's'd Br'k	19.91	62.8	6.81	427.66	3.92	16.76	6.29
Mack Lug Rep's'd Brick	21.61	57.7	7.06	407.36	4.25	17.31	6.84
Athens Repressed Block	29.65	42.2	9.50	400.90	4.60	18.44	7.97
Clearfield Repressed Bl'k	25.50	49.0	8.20	401.80	4.62	18.56	8.09
Clearfield Wirecut Block	46.7	58.8	6.31	399.75	4.79	19.04	8.67
Park Repressed Brick	21.25	58.8	6.31	371.03	5.69	21.11	10.64
McMahon Porter R. Br'k	22.42	55.7	7.07	393.79	5.41	21.30	10.83
Harris Repressed Block	28.90	43.3	9.00	389.70	5.61	21.86	11.39
Park Wirecut Brick	21.40	58.4	6.35	370.84	6.26	23.21	12.74
Bolivar Repressed Block	28.13	44.4	8.25	366.39	6.41	23.47	13.00
Guise Repressed Block	27.00	46.3	9.25	428.27	6.41	27.45	16.98
Preston Wirecut Brick	20.04	62.4	6.04	376.89	7.35	27.70	17.23
Park Repressed Block	31.50	40.0	9.30	372.00	7.22	27.85	17.38
Eastern Repressed Block	27.00	46.2	9.25	328.27	6.66	28.96	18.49
McMahon Porter R. Bl'k	29.28	42.7	9.14	390.27	8.40	32.78	22.31

"I hereby certify that the tests by which the above results were obtained, were uniform and accurate, and conducted in a fair and impartial manner. Conditions being 3,000 revolutions in the Jones Brick Testing Machine. Abrading charge 150 pounds of iron cubes 1½ inches square.

GOMER JONES, City Engineer."

Beautiful Muskoka

The Grand Trunk Railway System has the advantage of having one of the most beautiful lake districts in the world, for by its line alone can the delightful Muskoka Lakes be approached. Notwithstanding this, the best of accommodations as to train service, comfort and convenience of passengers, are to be found.

The journey to Muskoka is one of the most beautiful imaginable. Every inch of the way offers scenes of picturesqueness and beauty, from the smiling farm lands outside Toronto, to the emerald shores of Lakes Simcoe and Couchiching and later to the rugged and wild stretches of land on this side of Muskoka Wharf.

Beautifully printed, illustrated, descriptive matter sent to any address on application to Frank P. Dwyer, E. P. Agent, Grand Trunk Railway System, 290 Broadway, New York.

A New Paving Brick Plant

WORK on the plant of the Georgia Vitrified Brick & Clay Co., about twenty-three miles west of Augusta, Ga., is progressing rapidly. The company expects to be in the market with its product in the latter part of April, or the early part of May. The plant will be a very large one, having a capacity of twenty million pavers per annum, and ten cars of sewer pipe per day. The company owns over 1,000 acres of valuable clay and shale lands. The larger part of its machinery is furnished by Taplin, Rice & Co. of Akron, Ohio. The brick machinery, proper, is furnished by E. M. Freese & Co. The plant will be run by a 600 H. P. Hamilton Corliss engine. At present a battery of square down draft kilns is being put in by Mr. S. J. Plant, of Carbon Cliff, Ill., the inventor of the kilns. These kilns are of 100,000 brick capacity each.

Important Improvements in Fire Hose

DURING the past year the Eureka Fire Hose Company has made many important improvements in its special hose weaving machinery employed in making the well known brands of "Eureka," "Paragon," "Red Cross," "U. S. Underwriter," "New Peerless" Jacket, "New Surprise" Jacket and "Monitor" Jacket rubber lined cotton fire hose which have been patented in this and foreign countries and are destined to greatly improve these high grade standard brands and make them still more popular with the buying public.

With the new looms an extra ply of fine Sea Island yarn is ingeniously woven in the inner surface of the hose, filling the spaces between each of the strands entirely covering the ribbed, or corrugated surface, which was unavoidable in the old method of weaving the fabric. This virtually adds an extra ply to the hose, giving at least 25 per cent. additional strength, without materially adding to the weight.

This improvement can be inserted in any quality of hose manufactured by the Eureka Fire Hose Company, but it is the company's intention to apply it only to the high grade standard brands mentioned above. This will make the "Red Cross" brand, heretofore a single hose, practically a double hose; the "Paragon," as well as all other brands of jacket hose made by the company, previously double hose, a triple hose; and the Eureka, formerly a triple hose, a quadruple hose.

The Eureka Fire Hose Company has also put in new and special machinery for attaching couplings to its fire hose by hydraulic power by which two operators can attach over 250 fire hose couplings in one working day. Gauges are attached to the machine so that each coupling receives an equal amount of pressure during the process, thus avoiding any defects often found in carelessly coupled hose.

After the hose is coupled it is passed to testing tables, built especially from designs of Vice-Pres. B. L. Stowe, which are provided with an attachment for connecting thread, or, if the hose is ordered without couplings, it is tested by attaching special connections. A water pressure of 200 to 300 pounds per square inch is applied to hose with or without coupling. This precaution absolutely insures that the hose is perfect in construction, material and strength and that the couplings are properly attached and the hose leaves the factory in perfect condition.

A Snow Melting Machine

ONE of the most difficult, unsolved problems connected with the street cleaning department of New York is that of snow removal. What proves a blessing for the rural districts and some smaller cities is found the reverse in the great Metropolis; a fall of snow of six or more inches in depth may be looked upon in the nature of a calamity. It not only clogs the streets, retards progress of all kinds of traffic, more than doubles the burden of the horse and causes numerous inconveniences to man and beast, but entails upon the city a large expense for its immediate removal. The only practicable method thus far evolved has been to cart it away. This means the employment of thousands of men and hundreds of horses. The long hauls to the dumping places make progress necessarily slow.

Several experiments have been made, most of them involving the melting process to get rid of the snow. While hitherto these experiments have proven failures it has been demonstrated that the only solution of the problem lies in the invention of some snow melter that can be installed at comparatively slight expense at convenient intervals about the city, which will shorten the haul, expedite the work and reduce the cost. As a consequence, experiments have been continued along these lines, and last month during the heavy fall of snow, a new apparatus for melting snow was tried by Commissioner Woodbury. The machine was installed in connection with the exhaust steam pipe of the power plant upon the East Side, and had a capacity of sixty cubic yards per hour. The trial, which continued through the coldest days, when the temperature was under twelve degrees above zero and the conditions most trying, demonstrated that by installing similar plants at convenient intervals about the city the expense for snow removal could be reduced to one-fifth the present cost.

This apparatus has been patented by Mr. Paul J. Piatti, Woodside, N. Y., and with the co-operation of Mr. Frank K. Kane, a stock company with \$100,000 capital has been organized to push the manufacture of this snow melting apparatus. Our readers will be interested in a brief description of this apparatus.

The snow melting plant is provided with what is called a melting box, which is preferably built within masonry, arranged below the sidewalk, near the gutter, in such a position as to make it convenient for dumping snow into it from a wagon or cart. The melting-box is jacketed and is provided with a plurality of inwardly projecting nipples, through which the hot water is injected directly onto the snow in the box, so that the snow water flows away through a discharge pipe, emptying into a tank. From this tank is taken the additional supply of water necessary to be heated for melting the snow, thus saving expense for water supply. The waste water is piped to a nearby sewer and thus gotten rid of without difficulty.

The cost of running this apparatus is comparatively slight, as the janitor of a school building, or of any other building heated by steam or hot water, can easily attend to its operation without interfering with his other duties. The additional coal consumed would be very slight.

Annual Meeting of the N. B. M. A.

THE annual meeting of the National Brick Makers' Association was held at Boston, Mass., February 4-7, and included the discussion of many technical questions of interest only to the manufacturers of paving and building brick. The attendance was unusually large and the paving brick manufacturers were well represented, they having samples of their factories on exhibition. Among the paving brick manufacturers present were Winslow & Co., manufacturers of sewer pipe, paving brick, etc., with factories at Portland, Me.; Leary's Herculaneum Paving Brick Co., 581 Ellicott Square, Buffalo, N. Y., represented by William J. Leary, inventor, patentee and owner; Metropolitan Paving Brick Co., Canton, O.; T. B. Townsend Paving Brick Co., Zanesville, O.; New York and Paving Brick Co., Syracuse, N. Y.; The Barr Clay Co., Streator, Ill.; Purington Paving Brick Co., Galesburg, Ill.; Johnson Paving Brick Co., Boston, Mass.; Minnesota Clay Co., St. Paul, Minn., and the Brick, Terra Cotta and Tile Co., of Corning, N. Y.

The American Road Machinery Company, Kennett Square, Penn., was the only good roads machinery represented at the convention; Mr. F. L. Wright was in charge. This company makes the celebrated "Champion" crushing and road building machinery so well known and so generally used throughout the country.

Use of Sanitary Sewer Pipe a Necessity

THE rapid growth of American cities makes it almost impossible for towns and cities to keep pace with the consequent demand for public improvements. In this condition is found the reason why the death rate is so unnecessarily large in many municipalities. At the same time it offers a reason why public improvements which have to do with promoting the general health of a community should be taken up and pushed to a finish before others are even contemplated. For example, local conditions often make sanitary sewers an absolute necessity in order to protect the public health, while other localities are blessed with natural drainage which make such a de-



A PORTION OF THE PITTSBURG PLANT NOW IN USE

mand less pressing. But the majority of municipalities need some sort of a sewer system, either for storm water or sanitary purposes, or both.

There is little doubt in the minds of sanitary engineers as to the benefits which will accrue to any municipality going to the expense of constructing a system of sewers. The general demand for sewer pipe is becoming so great that the Pittsburgh & Buffalo Company, already large manufacturers of sewer pipe, brick, hollow block, etc., etc., has been forced to enlarge its plant. The present capacity of the plant is about 10,000,000 of brick a year, 10,000 feet of sewer pipe per day, besides a large output of hollow block and other products, as this company mines, manufactures and ships coal and coke. The plans for enlarging the plant will involve two years' work, but when completed it will be the best equipped and largest clay manufacturing plant in the world.

—It is reported from authoritative sources that a syndicate, including Messrs. T. K. Webster, D. R. Forgan, J. A. Spoor, D. M. Cummings and others closely identified with the First National Bank of Chicago has closed negotiations for a large interest in the Federal Asphalt Company, which has been under consideration for several months.

—The statement that the Stanley Electric Manufacturing Company has sold out to the General Electric Company is unauthorized. It is true that negotiations for a change of ownership of control of the Stanley Company are pending but in this connection it should be stated that, notwithstanding all the newspaper reports, the control of the Stanley Company has never passed into the hands of William C. Whitney. The plan to increase the capital stock of the company to \$10,000,000, notice of which was recently given from this office, has not been abandoned, as some reports have made it appear, and the permanency and enlargement of the works at Pittsfield is one of the details agreed upon in any event.

NOTES OF INTEREST TO THE TRADE

—P. C. Brennan, consulting and mechanical engineer, with offices at No. 1 Broadway, New York, has completed a large asphalt refining plant at Tampico, Mexico, for New York parties.

—The Allis-Chalmers Company, of Chicago, Ill., has issued the sixth edition of catalogue No. 15, which tells about its cement and rock crushing machinery. It has seventy-two pages and is well illustrated.

—The Standard Vitrified Conduit Company, 39 Cortland street, New York, has just issued a new catalogue of twenty pages, with cover, which gives many interesting points about conduit and many arguments why they should be laid. This company has an annual capacity of 25,000,000 feet of conduit.

—Comfort in travel is realized to the highest degree when traveling via the New York Central and Hudson River R. R. in connection with the Michigan Central R. R., to Detroit, Michigan points and Chicago. For folder and information, address W. H. Underwood, G. E. P. A., M. C. R. R., 299 Main street, Buffalo, N. Y.

—Charles D. Seeberger, the originator of the escalator system, sailed for Europe on the Oceanic, February 11th, where he will complete arrangements for installing escalators in the stations of the new London Underground Railroad, the preliminary negotiations having been conducted by the Waygood-Otis Company, of that city.

—The Kelly-Springfield Road Roller Company has opened a New York office in the S. Paul Building, 220 Broadway, and placed Mr. T. E. Pyley in charge. This company has just built and equipped a large factory, doubling its former capacity. All kinds of road rollers for macadam, country roads, street paving and municipal golf links are manufactured by this concern.

—Mr. Benjamin F. Emery, late Superintendent of Street Cleaning,

of Detroit, Michigan, has accepted a position with the Sanitary Street Sweeping Company, Washington, D. C. Mr. Emery has had several years experience in practical work and this company is to be congratulated upon securing the services of one who is so thoroughly familiar with the needs of street cleaning departments.

—The Chapman Valve Manufacturing Company, Indian Orchard, Mass., advises us that it has lately added to its list of water works specialties, an improved yard hydrant. This hydrant is specially designed for water works service where a number of families obtain water from one source of supply, for service in railroad yards, and for street washing; in fact, for any service where it is important to have a water supply that shuts off below the frost line. It is self-draining and consequently non-freezing.

—Many cities and towns are now installing filter plants in connection with their water works system, which is a favorable sign of the times. The Pittsburgh Filter Manufacturing Company, of Pittsburgh, Pa., has just completed a plant for the Sharon Water Works, of Sharon, Pa., having a daily capacity of 2,000,000 gallons; another plant for the Upper Sandusky Water Works, of Ohio, with a daily capacity of 1,000,000 gallons, besides having more than ten plants under construction for other cities and for manufacturers.

—The Buffalo-Pitts Steam Roller Works, of Buffalo, N. Y., have opened a New York office at 150 Nassau street, with Mr. J. A. Dewey in charge. This company's road rollers have been on the market for many years and have come to be regarded as the standard by many contractors. The annual output of these machines has been very large, including sales to the United States Government, city and county authorities, contractors, and private owners. The company takes particular pride in the fact that it can refer to any purchases as entirely satisfied.

LATEST NEWS FOR CONTRACTORS

Bids Wanted for Municipal Work—Franchises Granted—Contemplated Improvements—Contracts Awarded

PAVING

PROPOSALS FOR BRICK PAVING

State of Michigan, City of Menominee, City Clerk's Office.

Sealed proposals will be received at this office until 5 o'clock P. M. of March 16th, 1903, for furnishing the materials and doing the work for the paving and curbing of Main street in Menominee, Michigan, from the north line of Ogden avenue to the south line of Wells avenue and from the south line of Wells avenue to the north end of the drawbridge, with vitrified brick paving blocks and stone curbing. Each bid shall be accompanied by a certified check for five per cent. of the highest bid of such bidder and work on pavement shall be begun not later than June 1st, 1903, and be completed by August 31st following.

Printed copies of blank proposals, city engineer's estimates, and specifications may be had on application, by mail or in person, to the undersigned. The right is reserved to reject any or all proposals.

Proposals should be securely sealed in an envelope, endorsed "Proposals for paving Main street," and should be addressed to the undersigned.

Dated Menominee, Michigan, February 11, 1903.

WILLIAM SOMERVILLE, City Clerk,
Menominee, Michigan.

Savannah, Ga.—A portion of East Broad street will be paved with vitrified brick.

Manchester, N. H.—It is probable that Elm, Pearl and Granite streets will be improved, the cost of which will be about \$21,000.

Chilton, Mass.—An extension from Beach street to Green street is desired, surveys for which are under way. Parker & Bateman, 160 High street.

Newport, R. I.—The property owners on Carroll avenue have asked that the street be improved.

Harrisburg, Pa.—Specifications are now being prepared for the paving of Second, Fifth and Seventh streets. City Engineer Cowden.

Williamsport, Pa.—An ordinance will shortly be introduced in the Council for paving 15,000 square yards with asphalt or brick.

Fredericksburg, Va.—Means for building a highway from the Spotsylvania line to Gilling's mill, and other roads will be considered at a meeting to be held at Orange next court day.

Richmond, Va.—It is estimated that \$552,591 will be needed for the improvement of the streets of this city.

Memphis, Tenn.—The cost of concrete curb and gutters, paving brick, vitrified pipe, cement and granite for the year is estimated at \$40,000 to \$50,000.

Cincinnati, O.—A resolution to improve Herschel avenue and Chatham street with brick has been ordered prepared by the Board of Public Service.

Evansville, Ind.—Resolutions for the paving of thirty-four blocks and about seven miles of artificial sidewalks are being prepared.

Indianapolis, Ind.—It is reported that a number of streets will be improved during the coming year.

Mount Vernon, Ind.—A petition is being circulated for the building of twenty-two miles of rock roads in Robb township by the county commissioners.

Newcastle, Ind.—28,000 square yards of paving will be done here at an estimated cost of \$56,000.

Menominee, Mich.—Main street will be paved with brick, with concrete foundation and cement filler, at an estimated cost of \$25,000.

Burlington, Ia.—Plans for the paving of Valley street with brick have been prepared. The cost is estimated at \$27,000, which will include about 1,400 cubic yards of fill.

Findlay, O.—The cost of paving with vitrified or asphalt block is estimated as follows: Part of East Hardin street, \$4,475; part of West Front street, \$19,769; part of East Lima street, \$11,419.

Chicago, Ill.—West Lake street will be paved with asphalt, the cost of which will be about \$63,000; North Ann street will be paved with granite, at a cost of about \$16,500.

Freeport, Ill.—35,000 square yards of macadam and 20,000 linear feet cement curb and gutter will be constructed at this place. G. W. Graham, City Engineer.

Covington, Ky.—\$50,000 will be spent during the coming season in constructing brick streets. City Engineer Gunn.

Tiptonville, Tenn.—Press reports state that this place is desirous of constructing twenty-two miles of macadam road and is considering the question of bonding the county.

Fort Worth, Tex.—Brick pavement on part of Third street is under consideration.

Pasadena, Cal.—Asphalt pavement for part of E. Colorado streets is being talked of.

Montreal, Quebec.—It is stated that a stone crusher will be purchased by the Road Commissioner.

Winnipeg, Manitoba.—Bids are wanted March 3rd for 300 to 600 tons of asphalt for street paving. Chairman, Commission on Works.

So. Hadley, Mass.—It is stated that \$5,000 has been voted for state roads, the state to supply a similar amount.

New York, N. Y.—The widening of 59th street is again being considered.

Trenton, N. J.—Ordinances have been passed authorizing the asphalting of three miles of streets. Bids will be asked soon.

New Orleans, La.—An ordinance has been introduced for the paving of St. Charles street.

Sadlersville, Tenn.—The Legislature has been asked to authorize the issue of \$150,000 bonds for macadam roads.

Louisville, Ky.—West Broadway will probably be asphalted at \$75,000, and Letterie avenue may be paved later. Mayor Grainger.

Lexington, Ky.—An appropriation has been passed by the Council to spend \$9,000 on repairing brick streets.

Toledo, O.—Bids were asked on February 27 for \$121,000 paving bonds.

Fort Wayne, Ind.—Plans will be prepared by the Board of Public Works for paving Washington and West Main streets and Fairfield avenue, at a cost of \$20,000.

St. Joseph, Mo.—It is probable that asphalt will be used to pave Jule street. Other streets are to be paved soon.

Gonzales, Tex.—The Council will submit a bond issue of \$15,000 to the voters to make street improvements and buy fire equipments.

Seattle, Wash.—The improvement of Mercer street is being considered and will cost about \$25,700.

Simeco, Ont.—The improvement on roads has been voted. Town Clerk W. J. Donnell, Barrie, Ont.

Hartford, Conn.—It is reported that the macadamizing of the Laurel street extension has been recommended as part of the work to be done during 1903.

Mattapoisett, Mass.—A recent meeting of the citizens was held, at which, it is reported, it was voted to purchase a stone crusher.

Syracuse, N. Y.—A portion of Tracy street will be paved with Trinidad or Bermudez asphalt.

Millville, N. J.—High, Main, and Broad streets, and Columbia avenue, will be paved, shale block or vitrified brick being used.

Albany, N. Y.—Broadway, from State to Steuben streets, will be paved with asphalt.

Little Valley, N. Y.—Press reports state that a road machine will be purchased.

St. George, S. I., N. Y.—Portions of several streets will be paved with macadam and brick, according to press reports.

Somerville, N. J.—Bids are wanted March 4th for macadamizing three-quarters of a mile of road in Bridgewater Township. The specifications call for 8-inch macadam for the whole road complete, or 10-inch rock bottom for road complete. W. J. Logan.

Front Royal, Va.—The citizens of this place are considering issuing \$50,000 worth of bonds for macadamizing the main thoroughfares of Warren County.

Savannah, Ga.—A portion of Perry Lane will be paved with brick.

Savannah, Ga.—Asphalt pavement will be used on Gaston street.

Toledo, O.—This place is considering the paving of Millard avenue from Jessie street to the city line.

Springfield, Ill.—A petition is being circulated for the paving of North Seventh street—a distance of eight blocks.

Superior, Wis.—This place is considering the paving of Ogden avenue with asphalt.

Grand Rapids, Mich.—It is reported that Wealthy avenue will be paved with asphalt block.

Alba, Ia.—Bids are wanted March 2nd for the construction of 8,768 square yards of brick paving with 21,483 feet of curb. City Clerk.

Norwood, O.—Bids are wanted March 6th for \$10,143 bonds for street improvement. W. E. Wicgar, Clerk.

Rensselaer, Ind.—Bids will be received March 4th for the improvement of 44,000 feet of gravel roads. J. C. Thrawes, Supt.

Davenport, Ia.—Portions of several streets will be paved in accordance with the authorization of the City Council.

St. Louis, Mo.—It is stated that ordinances have been passed which provide for the expenditure of over \$2,000,000 for street work.

Louisville, Ky.—It is reported that bids will soon be asked for improving Von Borris avenue with asphalt paving for a distance of 2,000 feet.

Tullahoma, Tenn.—The issuing of \$200,000 in bonds to be used in the construction of good roads throughout the country is under consideration by the citizens of Coffee County.

Salt Lake City, Utah.—The cost of paving South Second street and Third South street is estimated at \$107,905.

Boise, Idaho.—Portions of Main and Eighth streets will be paved with brick, the plans and specifications for which have been filed.

Winnipeg, Manitoba.—Part of Spence street will be paved with asphalt and cut stone curbing constructed, the cost of which is placed at \$10,700.

Montreal, Quebec.—It is stated that considerable street improvements are to be made here, the paving of Victoria and Chaboillez Squares being part of the work under contemplation.

Providence, R. I.—Current report states that about \$155,000 will be spent by the Consolidated R. R. Co. in overhead street improvements, which will include the building of a bridge at Acorn street.

Newburgh, N. Y.—Part of Broadway will be paved with telford macadam and brick, bids for which work are wanted March 2nd.

Harrisburg, Pa.—Second street will be paved, plans for which are being prepared by City Engineer Cowden.

Washington, D. C.—The alleys in the west half of square 250 will be paved with brick or asphalt block at an estimated cost of \$2,350, and the alleys

in square 158 will be paved with the same material at an estimated cost of \$4,500. Commissioners.

Salisbury, Md.—It is stated that about 6,125 square yards of brick paving is being considered, at an estimated cost of \$15,312.

Brooklyn, N. Y.—Local reports state that plans are being considered for the improvement of Coney Island avenue at a probable cost of \$300,000. The part of the avenue to be improved is from Park Circle to Kings Highway.

Albany, N. Y.—A portion of Broadway will be paved with asphalt.

Baltimore, Md.—The following paving ordinances have been reported favorably: For paving seven streets with asphalt block at a cost of \$485,200; two streets with wooden block, at a cost of \$42,200; one street with Belgian block at a cost of \$28,000, and repairing O'Donnell street with vitrified brick, \$35,000.

SEWERAGE

Bridgewater, Mass.—A sewerage system for this place is receiving the attention of the citizens.

Brooklyn, N. Y.—Plans for two sewer extensions to cost \$600,000, are now being prepared. The main sewer will be 10 to 12 feet in diameter and the branch will be from 30 to 60 inches. Engineer Asserson.

South Bethlehem, Pa.—Plans and specification for a sewerage system have been approved. The estimated cost is \$100,000.

Smithville, Tenn.—The Smithville Sewerage Company has been granted a franchise.

Bowling Green, O.—The ordinance calling for the sewerage of 263, 581 and 65 feet with 6, 10 and 12-inch pipe has been passed. John White, Toledo, O.

Hartwell, O.—A bond issue for a sewerage system will be voted upon at the election in April, provided the report of the Council is favorable.

Grand Rapids, Mich.—It is expected that work will be begun at once upon the West Side Ditch if the Legislature authorizes the issuance of \$120,000 in bonds which are necessary for the purpose.

Wheaton, Ill.—\$55,000 is the estimated cost of constructing the ten or twelve miles of sewers for this place.

St. Louis, Mo.—A plan has been approved for the sewerage of the Cabanne street, viz., have the sewer run south on Belt avenue and enter the park at the terminus of Belt avenue.

Antioch, Cal.—It is stated that a special election will be held to vote on the raising of funds for constructing a sewer system.

Beverly, Mass.—A new sewer has been recommended for Derby street.

Plymouth, Mass.—It was recently voted to build sewers in the northern part of the town to cost \$27,000. A \$20,000 pump and station is contemplated.

Corinth, N. Y.—Plans for a new sewer system have been prepared by J. S. Mott & Son and sent to the State Board of Health.

Cape May, N. J.—The extension of the sewerage system is estimated to cost \$120,000, part to be paid by the Cape May Real Estate Company.

Millville, N. J.—Surveys are being made for a sewerage plant. L. H. Hogate, City Clerk.

York, Pa.—The question of a sanitary sewer system is under discussion, and a committee has been appointed to convince people of its need. City Engineer McKinnon.

Washington, D. C.—Appropriations have been asked from Congress for a sewage disposal plant.

Sandusky, O.—The lowest bid for the Campbell street sewer was from Frank Henry & Sons at \$1,693.

Clinton, Ill.—A sewer committee has reported that the sewers are in need of improvements. Mayor Farver.

Winfield, Kan.—The business men of this place have been agitating for a sewer system.

Seattle, Wash.—The city engineer will estimate the cost of a sewer system for the Queen Ann Hill district.

Everett, Mass.—The surface drainage system will be completed at a cost of \$100,000 if the Legislature will grant the Mayor authority to borrow this sum.

Dayton, O.—F. M. Turner has submitted plans for five miles of sanitary sewers.

Smithfield, Tex.—It is reported that the Smithfield Sewerage Company has been organized and that a fifty-year franchise has been received from the city.

Bisbee, Ariz.—It is reported that an election will be called to vote on a bond issue for a sewerage system.

Fresno, Cal.—Owing to the failure of the passage of the ordinance calling for the issuing of sewer bonds, the matter will be re-submitted at an early date.

San Francisco, Cal.—Press reports state that the Sixth street sewer will be reconstructed, the cost of which will be about \$50,000.

Portland, Me.—The estimated cost for collecting and disposing of the sewage on the west side district is given by Mr. Rudolph Hering of New York as follows: Sewer to Fore River, \$66,671; if extended to the permanent outfall, \$79,250.

Meriden, Conn.—Bids will be received until March 5th for furnishing vitrified pipe, brick, cement, etc. Board of Public Works.

Hartford, Conn.—It is reported that plans are being prepared for a system of sewers for the relief of the Franklin avenue sewer.

Corning, N. Y.—It is stated that \$40,000 bonds have been voted for sewer construction.

Binghamton, N. Y.—The City Engineer has been authorized to make a survey for a trunk sewer system for the western part of the city.

Atlanta, Ga.—Three septic tanks and purification plants for each tank have been recommended by Rudolph Hering of New York. The cost of this improvement is placed at \$135,000.

Pensacola, Fla.—Press reports state that an election will be held at this place

to vote on sewerage, street paving, and general improvement bonds in the amount of \$75,000.

Columbus, O.—An ordinance will doubtless be passed by the Council which will provide for the construction of a relief sewer in Russell street.

Marshfield, Wis.—The issuance of bonds for the construction of a sewerage system is under consideration.

Jacksonville, Ill.—Sewers of vitrified pipe from 12 to 20 inches in diameter, will be constructed on two streets. City Engineer Brown.

Rock Island, Ill.—Bids are wanted March 3rd for the construction of the Hampton Drainage Ditch, 91,000 cubic yards excavation.

Edgerton, Wis.—At the spring election the citizens will doubtless vote on the question of constructing a sewerage system, plans for which have been completed.

Burlington, Kan.—Contracts will be let for sanitary sewers at this place as soon as Burns & McDonald, of Kansas City, Mo., have completed the plans.

Davenport, Wash.—Plans for a sewerage system will be prepared by Otto Weile, Spokane.

Mayfield, Cal.—The construction of a sewerage system is under consideration.

PUBLIC BUILDINGS

Jamaica Plains, Mass.—Mack & Moore submitted the lowest bids for building the school on Heath street at \$187,000.

Buffalo, N. Y.—The sum of \$500,000 is available for the erection of new schools this year and five new sites have been recommended.

Schenectady, N. Y.—The council has appropriated \$140,000 for the erection of two new schools.

Paterson, N. J.—The State Assembly has been asked to pass a bill appropriating \$300,000 for a State normal school.

Hazleton, Pa.—A vote was to be taken on February 17 on \$60,000 bond issue for a new school. E. F. James, Secretary School Board.

Pittsburg, Pa.—The county commissioners have purchased property about the jail and will enlarge the same.

Sharon, Pa.—A special election was held in February to vote on the issue of \$80,000 school bonds.

Wilkes-Barre, Pa.—Bids are wanted on March 11 for a low-pressure steam heating apparatus to the United States Post Office. J. K. Taylor, Treasury department, Washington, D. C.

Moundsville, W. Va.—On April 1, contracts for the proposed addition to the West Virginia Penitentiary will be awarded. C. E. Haddox, Warden.

Tuscaloosa, Ala.—A vote will be taken on March 1 on the question of a new court house. M. C. Thomas, Chairman County Commissioners.

Franklin, La.—Plans are wanted for the erection of a new court house to cost \$110,000. J. M. Ibert, President.

Chattanooga, Tenn.—One hundred thousand dollars have been set aside for the erection of a new city hall.

Fall River, Mass.—The erection of a municipal building for this city is being considered, the same to cost \$100,000.

Taunton, Mass.—Plans for the two-story Carnegie library are said to have been prepared. Albert R. Ross, architect.

Philadelphia, Pa.—Plans for the Municipal Hospital for Contagious Diseases for the 39th Ward are said to have been prepared.

Washington, D. C.—It is stated that a building for the Department of Agriculture will be constructed at a cost of \$1,500,000.

Cleveland, O.—Plans are being prepared for the court house to be erected at Ontario and Lake streets. The building will be four stories high, 520 by 250 feet.

Minneapolis, Minn.—Bonds will be issued for the erection of a court house and city hall.

Portsmouth, O.—Bids for erecting the Carnegie library will be received until March 16th. E. D. Poffenberger, Secretary Library Board.

Elba, Ala.—Reports state that \$20,000 will be spent for the erection of the Coffee County court house at this place.

New Decatur, Ala.—An issue of \$25,000 worth of bonds is suggested for the erection of a city building.

Fall River, Mass.—\$150,000 will probably be spent to erect three new schools this spring.

Pittsburg, Pa.—Plans for two schools, one at Braddock avenue and the other at Sheridan avenue, have been approved. The cost of same is placed at \$100,000 each.

Gainesville, Ga.—Plans for a \$20,000 school for this place are being prepared by Architect Wilson of Columbia.

Bowling Green, O.—An issue of \$15,000 school bonds is said to have been voted.

Minneapolis, Minn.—Public school bonds in the sum of \$200,000 have been authorized by the Senate.

Eau Claire, Wis.—An addition will be made to the high school at this place at a cost of \$25,000.

Junction City, Kan.—A \$30,000 high school will be erected at this place.

Lakewood, O.—At the next election, a vote will be taken on the question of issuing \$75,000 bonds for a school.

Mt. Vernon, O.—In the spring a vote will be taken in Knox County on the question of building a new county jail.

Lawrence, Kan.—Plans for a new court house have been approved by the commissioners of Douglas County. Cost is placed at \$80,000.

Topeka, Kan.—Bonds may be issued in the sum of \$131,000 for use by the school board.

Corsicana, Tex.—Plans are about to be selected for the \$125,000 court house. A. B. Graham, County Judge.

Toronto, Ont.—Carnegie has offered to give \$350,000 for public libraries.

Buffalo, N. Y.—A new marine hospital to cost \$125,000 will be erected at this place as soon as the site has been selected.

Buffalo, N. Y.—Plans are now being prepared for a new brick school building.

Abbeville, Ga.—Plans and specifications for a new county court house are being prepared. The cost of this building is placed at \$50,000.

New Orleans, La.—The matter of a site for the proposed court house is now occupying the attention of a special committee.

Knightstown, Ind.—An addition to the court house is being talked of.

Lincoln, Ill.—A court house to cost \$150,000 will be erected at this place. J. M. Deal, Architect.

Des Moines, Ia.—Bids are wanted until March 10 for sixteen buildings and two brick smokestacks. Board of Control of State Institutions of Iowa.

Webster, S. D.—Plans are being prepared for the new Day County court house. William Egeland, County Auditor.

Fort Smith, Ark.—Press reports state that bids are wanted until March 10 for the construction of the extension to the United States Court House and post office.

Buffalo, N. Y.—A new public market of steel, glass and granolithic floor, and no wood at all is being talked of for this place.

Wilmington, Del.—It is probable that there will be a bond issue for a city hall.

Logansport, Ind.—Plans are being prepared for a public library to cost \$25,000. Quincy A. Myers, Secretary Board of School Trustees.

Terre Haute, Ind.—It is reported that the sum of \$50,000 has been offered this city by Crawford Fairbanks for the purpose of erecting a library.

Augusta, Ga.—Andrew Carnegie has offered this city \$50,000 for a library.

Hornellsville, N. Y.—Twenty-five thousand dollars have been offered this place by Andrew Carnegie for a library.

Buffalo, N. Y.—Plans and specifications are being prepared for an eight-room school on Leroy avenue by F. G. Ward, Commissioner of Public Works.

Carthage, N. Y.—Plans for a 50 x 80-foot high school at James and Fulton streets are being prepared by D. D. Kieff, Watertown.

Bayonne, N. J.—It is stated that \$100,000 in bonds will be issued for the erection of a school.

Marion, Ind.—Press reports state that the contract for erecting the high school at a cost of \$69,190 has been let to James Long.

Colfax, Ill.—A high school is being considered to replace the one destroyed on January 28 by fire. The probable cost is placed at \$30,000.

Durant, Ind. Ter.—It is stated that \$15,000 school bonds have been voted.

El Reno, Okla.—Reports state that school bonds to the amount of \$30,000 have been voted.

WATER WORKS

Enfield, N. H.—The Fire District will construct and maintain a water system.

Easthampton, Mass.—About \$9,500 will be spent to enlarge the water supply of this place, according to reports.

Waterbury, Conn.—Local reports state that the water mains will be extended at a cost of about \$15,000.

Lancaster, Pa.—Samuel M. Gray, of Providence, R. I., will prepare plans and specifications for improving the water system. It is estimated that these will cost in the neighborhood of \$145,000.

Reading, Pa.—Two hundred and ten thousand dollars have been appropriated by an ordinance of the council for the Water Department for the coming fiscal year.

Wilmington, Del.—It is reported that new water mains will be laid in the Ninth Ward.

The New Castle County Hospital desires to install a water plant.

Middletown, Md.—Ten thousand dollars worth of water bonds are sold, according to reports.

Orange, Va.—A committee has been appointed to find out the cost of installing water works at this place. Mayor Perry is one of the committee.

Sandersville, Ga.—Water works and an electric light plant will be constructed at this place, the cost of which is estimated at about \$40,000. Mr. Wilcox, of Macon, Engineer.

Hawkinsville, Ga.—It is reported that water works and a sewerage system will be constructed at this place, for which \$40,000 will be spent. T. J. Holden, City Clerk.

Rockford, Ill.—The water mains of this place will be extended at a cost of \$25,000.

Oswego, N. Y.—It is stated that the taxpayers of this place will vote upon changing the supply from the river source to the lake.

Savona, N. Y.—Water works are being considered by this place.

Watertown, N. Y.—It is stated that bids will soon be asked for constructing a 6,000,000-gallon mechanical filtration plant at a cost of \$100,000.

Yonkers, N. Y.—Plans and specifications for a filter plant will be prepared by Allen Hazen, of New York.

Summit, N. J.—A committee has been considering the advisability of municipal ownership of the water and light plants of this place.

Allentown, Pa.—It is stated that the city will receive bids at the end of this month for the laying of a water main from Schantz Spring to the city.

Barnesville, Va.—Municipal water works are being discussed.

Williamsburg, Va.—The business men of this place are in favor of issuing bonds to the amount of \$30,000 for water and fire purposes.

Moundsville, W. Va.—The construction of a new reservoir with higher pressure is being considered.

Greensboro, N. C.—The authorization of \$250,000 worth of bonds for extending the water and sewerage systems and also for street improvement is asked of the legislature.

Donaldsonville, La.—The water works system of this place will doubtless be extended.

Barnesville, O.—At a recent election \$75,000 worth of bonds were voted for construction of water works.

Troy, O.—The citizens are considering the extension of the water service to the east end of the city.

Anderson, Ind.—It is reported that a bond issue is probable for the construction of a filtration plant which will be adequate to the needs of the city.

Muncie, Ind.—Water works and an electric plant are desired by Normal City, and it has petitioned the Legislature to be allowed to assume a greater bonded indebtedness for this purpose.

Cheboygan, Mich.—It is reported that the city will soon receive a proposition to purchase the local water works.

Sterling, Ill.—It is stated that a mile or two of new water mains will be laid by the Sterling Water Company. J. Decker, Supt.

Fontanelle, Ia.—Press reports state that water works will be erected here.

Egan, S. Dak.—\$5,000 worth of water works bonds have been voted by this place.

Veblen, S. Dak.—The citizens of this place are agitating the question of water works.

Durant, Ind. Ter.—The recent election at this place resulted in the defeat of the proposition to issue \$65,000 water bonds.

Hotchkiss, Col.—Water works for this place is now under consideration.

Seattle, Wash.—A re-advertising for bids for construction of water mains in First avenue has been ordered owing to the fact that the previous bids received were all too high.

Ashland, Ore.—About a mile of 18-inch water main has been authorized by the Council.

Easthampton, Mass.—The Water Commissioners recommend that the water supply be improved at an expenditure of \$9,500. The improvements include a new pump and water wheel.

Falmouth, Mass.—It is estimated that \$40,000 will be spent to extend the water works to West Falmouth.

South Groveland, Mass.—The matter of a water supply from Johnson's Pond is being talked of.

Whitman, Mass.—In their annual report the water commissioners recommend a new water supply.

Woonsocket, R. I.—A new engine is needed at this place. E. W. Kent, Superintendent Water Works.

New London, Conn.—Work on the new reservoir will be commenced early in the spring. A pumping station will also be installed, and pipe laid. H. S. Richards, Superintendent.

Waterbury, Conn.—\$13,125 will be spent by this place for water mains. P. A. Cairns, City Engineer.

Batavia, N. Y.—A supply of water from Seven Springs and Gardner's Pond is being talked of.

Dunkirk, N. Y.—2,200 feet of 24-inch cast-iron pipe will be laid in Robin street. The cost of this extension is placed at \$11,000. M. A. Doughty, Supt.

Glen Cove, N. Y.—Press reports state that a public water service will be installed at this place.

Homer, N. Y.—Water mains for this place are asked by the citizens.

Horseheads, N. Y.—The advisability of obtaining a water supply from Breesepor is under consideration. The cost of obtaining and distributing the same is placed at \$100,000.

Kenosha, Wis.—It is reported that a standpipe will be erected here.

Bird Island, Minn.—Water works will be constructed at this place.

Lake Park, Minn.—Bonds in the amount of \$11,000 have been voted for water works.

Lake Wilson, Minn.—W. D. Lovell, Des Moines, Iowa, will prepare plans for water works at this place.

Knoxville, Tenn.—It is reported that bonds will be issued for the purchase of the plant of the Knoxville Water Company.

Memphis, Tenn.—It is reported that \$1,250,000 worth of bonds have been sold which will be used to purchase water works.

Crowley, La.—An election is being considered to vote on the issue of \$100,000 bonds for an electric light plant and water works.

Chinook, Mont.—It is expected that contracts will be let about the first of May for the construction of water works. Loweth & Wolff, St. Paul, are the engineers.

Ashland, Ore.—It is reported that about one mile of 18-inch main will be purchased and installed, at a cost of about \$8,000. This will take the place of the 10-inch main next the intake.

Lordsburg, Cal.—The Cetras Water Company has been incorporated with a capital of \$20,000.

Lexington, Mass.—Contracts will be let March 15 for 9,000 feet of 12-in. cast-iron water pipe. Water Commissioner Looke.

Yonkers, N. Y.—Bids are wanted by the Water Commissioner for pipes and castings until March 5th.

Gallatzin, Pa.—It is stated that a company has been formed for constructing water works at this place. F. U. Ferguson is said to be interested.

McKees Rocks, Pa.—It is reported that a franchise has been granted the Fleming Park Water Co. for piping the borough.

Concord, N. C.—Bids will be received until March 3rd for the construction of water works. Board of Water Commissioners.

Bird Island, Minn.—Press reports state that a vote has been taken and that water works will be constructed.

Marquette, Mich.—The extension of mains and intake pipe is being considered.

Flint, Mich.—Municipal water works are being considered for this place and an estimate of the probable cost is being prepared.

Pontiac, Mich.—It is stated that \$15,000 worth of water bonds have been sold.

Omaha, Neb.—This city has been granted power to acquire municipal water works.

Lakeview, Cal.—The supply of the Lakeview Water Co. will be increased, for which \$65,000 will be expended.

Salt Lake City, Utah.—The following improvements are recommended by the City Engineer: The destruction of a storage reservoir at the forks of Parley's canyon, the acquisition of at least part of the primary water rights in Big Cottonwood Creek, and the construction of a reservoir of at least 5,000,000 gallons capacity; an intercepting sewer in the western part of the city, a pumping plant at 9th and N; the construction of a bulkhead across City Creek; the construction of a conduit to take the place of the present wooden flume from the screens to the brick tank in City Creek canyon; the extension of dead ends in the present water works system; the construction of automatic flush tanks at all dead ends of the present system; the extension of water mains through the blocks in the business district and the placing of hydrants for fire protection.

Claremont, Cal.—Contracts will be let in about a month for \$15,000 worth of improvements.

Suisun, Cal.—An election will be held March 25th to vote on the question of constructing a 5-inch pipe line at a cost of \$25,000. F. W. Gabriel, Town Clerk.

Dexter, Me.—The matter of a water works system has been discussed and some action will probably be taken in March.

Littleton, N. H.—A committee will petition the Legislature for a charter for a municipal water works system.

Lexington, Mass.—It was voted recently to enter the Metropolitan Water and Sewer System, and \$44,000 were voted for mains.

Bristol, R. I.—Petitions have been signed asking that the Warren & Bristol Water Works Company be compelled to establish a filter plant.

Milford, Conn.—A contract will be made with the Milford Water Company to supply the town for \$300 a year.

Waterbury, Conn.—It was voted by the aldermen to appropriate \$100,000 bonds for a high-service water system if the authority were given them.

Brooklyn, N. Y.—Deputy Water Commissioner Van Iderstein has said that the supply is entirely inadequate and that \$1,350,000 was needed for improvements.

Niagara Falls, N. Y.—The Niagara Falls, Ont., officials desire to lay a six-inch main to connect with this city.

Rochester, N. Y.—A plan to place the entire city on a meter basis has been favored by Commissioner of Public Works J. Y. McClintonck.

Tonawanda, N. Y.—Surveys will be made for a 24-inch main to be laid at a cost of \$6,000. City Engineer.

Watertown, N. Y.—It has been proposed to construct a \$10,000 filter plant. Supt. Water Works Salisbury.

Camden, N. J.—The Chief Engineer of the Water Department has recommended that additional pumps be installed at the Morris station, that a 36-inch main be laid and a dynamo installed.

Finleyville, Pa.—The Finleyville Water & Power Company has been organized to supply this place. George C. Boggs, incorporator.

Oxford, N. C.—The Legislature will be asked to allow the issue of \$25,000 bonds for water works.

Gadsden, Ala.—The local water company will improve their plant and system to compete with a new company to which a franchise was recently granted.

Maryville, Tenn.—The question of installing water works has been under discussion for some time.

Owensboro, Ky.—About \$200,000 bonds will be sold and the proceeds used to install water works.

Mishawaka, Ind.—The question of municipal water works has been discussed by the Council. Mayor M. W. Mix.

Valparaiso, Ind.—The city will endeavor to purchase the water works of the local company as, according to the franchise, after fifteen years' duration, the city was to have that right. Mayor W. F. Spooner.

Flint, Mich.—A vote is to be taken at the next election to decide on the question of a municipal water works.

Normal, Ill.—The question of a universal water meter system has been under discussion in the Council.

St. Croix Falls, Wis.—Bids are wanted May 1 for new water works to cost about \$8,000. S. J. Wall, President.

Thief River Falls, Minn.—It is stated that water works will be installed this spring.

Broken Bow, Neb.—The Council will call a special election to vote on bonds for a municipal water works system.

Parker, S. D.—It is reported that a vote will be taken soon on the issue of bonds for water works.

Humansville, Mo.—It was voted to issue \$8,000 bonds for water works, and this sum may be largely increased.

Springfield, Mo.—If a twenty-year franchise is given the local water company, it promises to improve its plant and give the place two fire engines.

Granger, Tex.—It is proposed to extend the water works and install a gasoline engine, etc.

Lawton, O. T.—It is stated that bids for the proposed water works will not be called for two months.

Oklmulgee, Ind. Ter.—A vote will be taken on \$30,000 bond issue for water works, etc.

Long Beach, Cal.—A franchise for water works has been asked by John Carroll.

Mt. Pleasant, Utah.—The question of issuing bonds for water works has been under discussion.

Phoenix, Ariz.—The Council has called an election to vote on \$300,000 bonds for a municipal water works system.

MISCELLANEOUS

Monongahela, Pa.—All overhead wires at this place must be placed underground within a year, in accordance with ordinances lately passed.

Marietta, O.—Ten thousand to 15,000 barrels of Portland cement will be used in the construction of a reservoir here, for which bids are wanted until March 7.

Portland, Me.—Bids are wanted March 12 for dredging and rock excavation in Carver's Harbor, Me. Major S. W. Roessler, United States Engineer, 537 Congress street, Portland.

Philadelphia, Pa.—The 26-foot channel of the Schuylkill River is to be widened, at an expenditure of \$400,000.

Portland, Ore.—Bids are wanted March 16 for constructing a dipper dredge complete, or for dredging machinery only. Captain W. C. Langfit, United States Engineer, Portland.

Brooklyn, N. Y.—The improvement of Coney Island avenue is under consideration. It is estimated that to carry out the plans now under contemplation will cost about \$300,000.

Cincinnati, O.—An ordinance, calling for a bond issue of \$1,000,000, to be used for park and playground purposes, has been drawn up.

San Diego, Cal.—Bids are wanted March 5 for a 15-ton steam road roller. F. H. Dixon, Secretary Board of Public Works.

Wilmington, Del.—Bids are wanted March 9 for dredging in Mantua, Roccorn and Alloway Creeks, N. J. Colonel Jared A. Smith, United States Engineers.

Duluth, Minn.—Bids are wanted March 9 for 40,000 cubic yards of dredging at Ashland, Wis., and Ontonagon, Mich. Captain D. D. Gaillard, United States Engineers.

Chicago, Ill.—It is reported that Mayor Harrison is in favor of installing a creosote block plant at the Bridewell prison, so that the city could make its own paving material.

Chattanooga, Tenn.—The public improvement committee has decided to set aside \$50,000 for parks in the next bond issue.

St. Augustine, Fla.—Bids are wanted April 17 for a dredge and snag-boat having a steel hull and being of the stern wheel type. Captain Francis R. Shunk, United States Engineer.

FIRE APPARATUS.

Montreal, Que.—The council committee on fire wants funds to purchase three 1,000 gallon engines. \$10,000 for hydrants and \$5,000 for new hose towers.

Schenectady, N. Y.—A bill was introduced into the State Legislature authorizing the issue of \$40,000 bonds for fire, police and repair departments.

Syracuse, N. Y.—Plans for a fire engine house in the Seventeenth Ward to cost \$10,000 have been prepared by Gordon A. Wright, architect.

Pittsburg, Pa.—Two engine houses are to be built to cost \$15,000 and \$27,000 respectively.

Crookston, Pa.—Bids are wanted on March 10 for a combination city service hose wagon. W. A. Lanctot, City Clerk.

Corning, N. Y.—Ten thousand dollars will be spent for increasing the fire protection at this place.

Chambersburg, Pa.—On February 17 a special election was held to vote on a \$10,000 bond issue for use in the fire department.

Dallastown, Pa.—The issue of \$5,000 worth of bonds for fire department use were voted on February 17.

Fort Wayne, Ind.—Fire apparatus for the School for Feeble Minded is greatly needed and steps looking to its installation are now being taken.

Glenwood, Ia.—Sealed proposals will be received until noon March 10 for the erection of a fire station for the Feeble Minded Children's Institute. The building is to be of brick. Board of Control of State Institutions of Iowa.

London, Ont.—If the recommendations of Fire Chief Roe are carried out this place will purchase extra steam fire engines as well as a chemical engine.

Winthrop, Mass.—A chemical engine will be purchased for the fire department at this place, for which \$1,200 has been voted by the town.

GARBAGE AND SEWAGE DISPOSAL

Wheaton, Ill.—Ordinances have been passed for a combined system of sewers and a septic tank disposal system. Board of Local Improvements.

Fort Slocum, N. Y.—A garbage crematory has been authorized by the quartermaster general, New York.

New York, N. Y.—An ordinance has been passed allowing the borough presidents to contract with private parties for street sprinkling.

Hazelton, Pa.—The question of a garbage disposal plant to cost \$10,000 has been under consideration.

Atlanta, Ga.—Plans for a garbage crematory have been made by Collier & Browne, American Bldg., for the city.

Chicago, Ill.—\$2,000,000 was one of the items in the 1903 estimates for street cleaning and garbage removal.

Orange, N. J.—The need of a garbage crematory is commented on by Wm. Schluer, Secretary Board of Health.

Alexandria, Ind.—It is reported that the cost of a new garbage furnace is under investigation. City Engineer W. J. Overman.

Kalamazoo, Mich.—This place is considering the purchase of a garbage crematory.

Atlanta, Ga.—Three septic tanks and purification plants for each tank are recommended by Rudolph Hering of New York. This will entail a cost of \$135,000.

CONTRACTS AWARDED

Brooklyn, N. Y.—The Cranford Company, 215 Montague street, bid the lowest for asphalt paving on Cleveland street, their bid being as follows: 3,100 square yards asphalt at \$1.50; 430 cubic yards of concrete at \$5.75; 11 manhole covers at \$6.00.

Rochester, N. Y.—It is stated that the contract for repairing the Trinidad asphalt pavements on which the guarantees have expired has been let the Rochester Vulcanite Company for \$14,200. New bids will be asked for repairing rock asphalt pavements.

Union, N. J.—Callary & Murphy, of Weehawken, were awarded the contract for block and asphalt paving on New York avenue, their bid being as follows: 200 cubic yards earth excavated, .01; 1,600 cubic yards sand fill, .01; 7,000 square yards trap rock, \$1.75; 550 square yards asphalt paving, \$2.95; 3,000 lin. ft. new curb, .40; making a total of \$16,327.

St. Paul, Minn.—Contract let L. G. Washington for constructing 40,000 feet of cement sidewalks at \$41,049. Contract let P. H. Thornton for macadamizing part of Concord avenue at \$10,171.

(Continued on page 19.)

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